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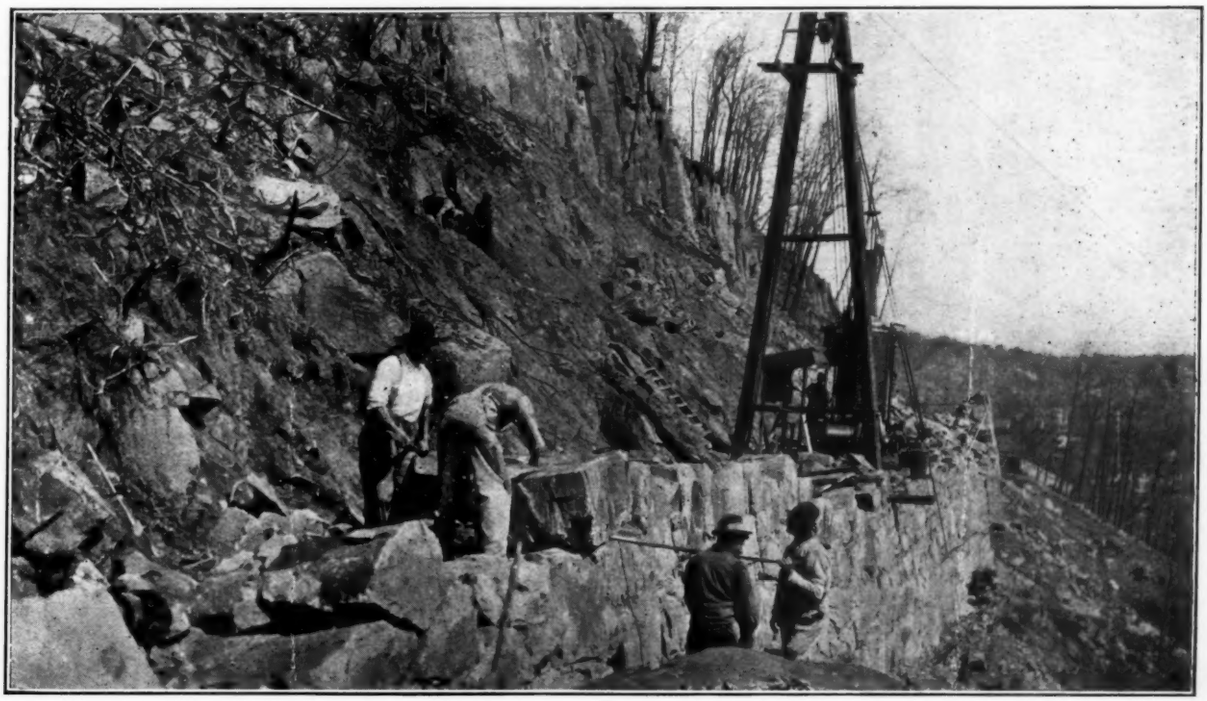


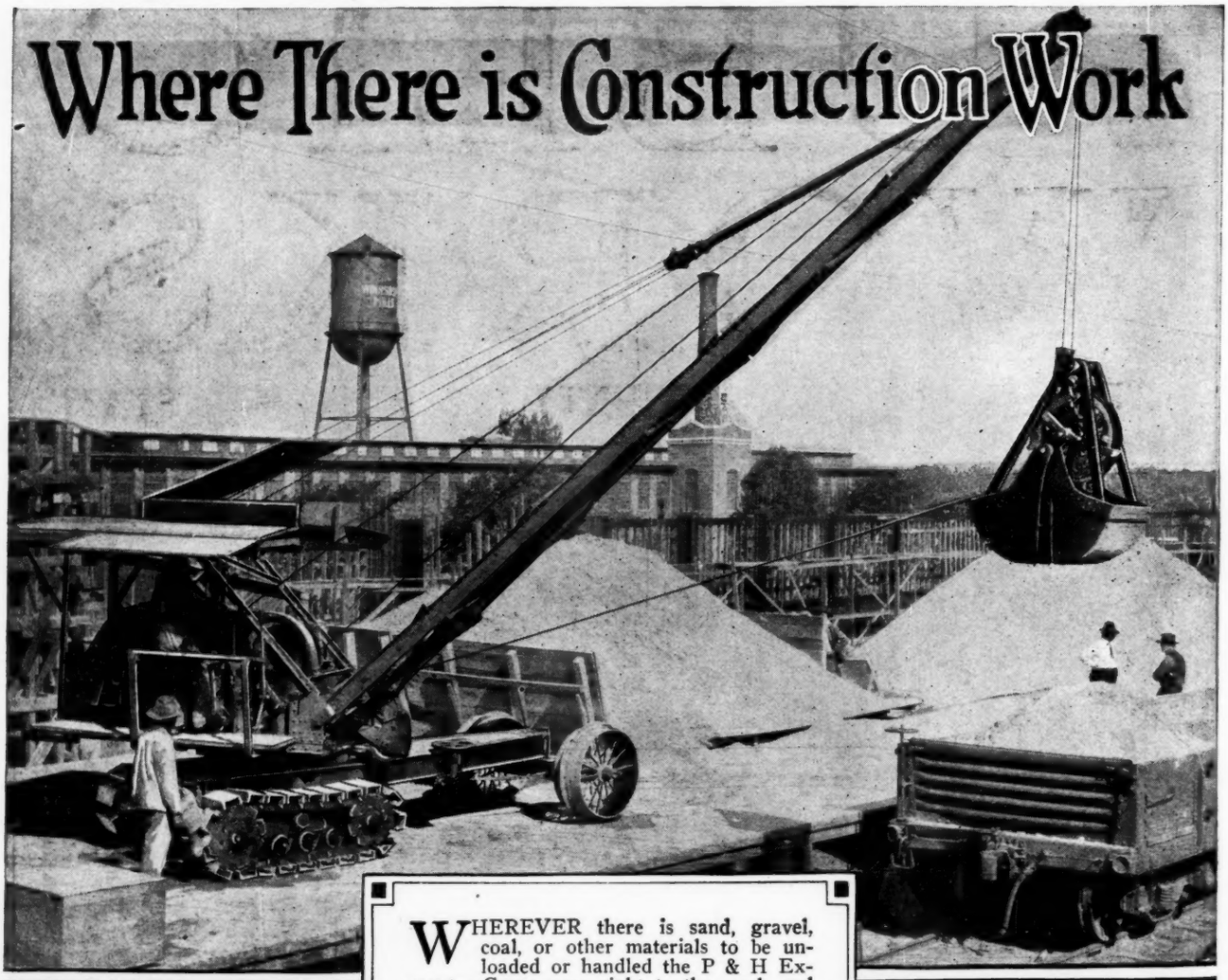
CONSTRUCTING RETAINING WALL ON PALISADE ROAD

IN THIS ISSUE

Heavy Work on a New Jersey State Road
Oregon Highway Testing Department
Gravel Roads in New Hampshire
Paving Materials in Various Counties
Handling Gravel from Car to Mixer
Central Storage Plants for Concrete Mixers

MAY 28, 1921

Where There is Construction Work



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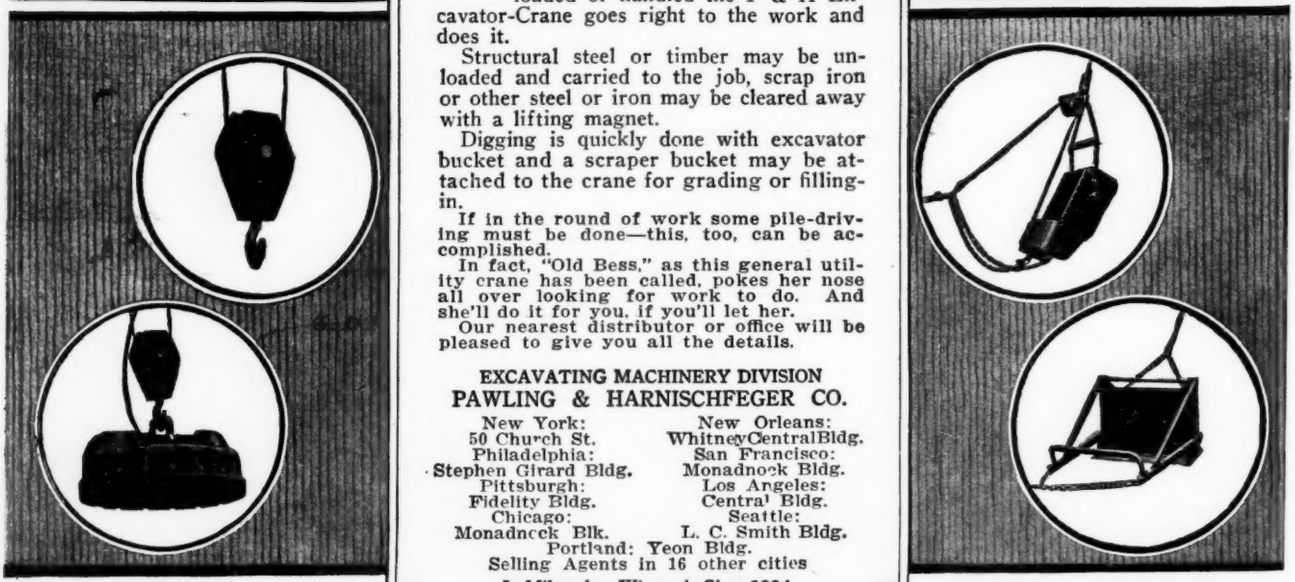

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A Combination of "MUNICIPAL JOURNAL" and "CONTRACTING"
Published Weekly by Municipal Journal and Engineer, Inc.
Publication Office, Floral Park, N. Y. Advertising and Editorial Offices at 243 W. 39th St., New York, N. Y.
Entered as Second-Class matter at the Post Office at Floral Park, N. Y., August 27, 1920, under the Act of March 3, 1879

Vol. 50 MAY 28, 1921 No. 22

Heavy Work on a New Jersey Road

Grading a mile of zig-zag highway from the Hudson river at Fort Lee to the top of the cliff, 210 feet above, at a cost of $500,000; 115,000 yards of rock excavation in side-hill cuts up to 110 feet deep. High retaining walls built with three cableways.

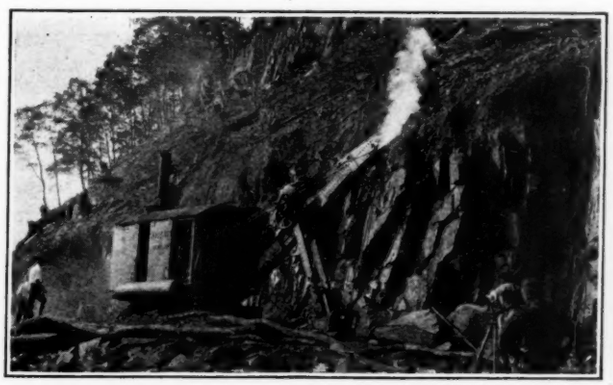
Section 1-A of Route 10 of the New Jersey State Highway System extends from the Fort Lee terminal of the 130th Street ferry, New York, to Arcadian way, rising about 210 feet to the top of the rocky bluff and having a length of about 6,000 feet. It was designed and the construction supervised by the State Highway Commissioners, T. J. Wasser, state highway engineer. In 1919 the contract was started by Porter & DeWitt, of Edgewater, N. J., who have prosecuted the work under difficult conditions and have brought it to completion by vigorous and efficient efforts and the installation of a large amount of labor saving plant and equipment.

The contract price of about $500,000 included grading, draining and the construction of retaining walls and parapets, but did not include the road surfacing.

LOCATION AND DESIGN

The road zig-zags up the face of the steep cliff in two long and approximately parallel inclines with maximum grade of 6½ per cent and curves of about 1,000 feet radius. The inclines are connected by 180-degree curves, which are 150 feet across transversely, and widened to 74 feet with a horizontal section between the two inclines. These curves are located chiefly on a heavy rock fill about 400 feet long on top and 50 feet high, which contains about 40,000 yards of rock wasted from the excavation. The most of the remainder of the rock excavated was dumped alongside the cuts building up, in some places, the outer edge of the roadway of the lower incline. At the top of the upper incline the road has another short bend of about 180 degrees, and grade of about 2 per cent. About 600 feet farther on it bends about 90 degrees, connecting with an existing road on the top of the hill.

The graded width of the road is 44 feet and the paved width will be 34 feet plus one 8-foot sidewalk. The road is built chiefly in terrace excavated in rock cuts up to 110 feet high on one side, and for 75 per cent of the length of the section, with retaining walls on the opposite side up to 50 feet high, in trenches up to 15 feet deep. Retaining walls 3 feet thick at the top and battered 2 inches per foot, are made of large pieces of rubble rock obtained from the cuts, sometimes laid up dry, and sometimes with cement mortar, and are all provided with abundance of weep holes to drain the water from the loose rock fill on the highway side. These retaining walls contain



CENTRAL PORTION OF SHOVEL CUT ON NORTH LOOP

DRY WALL ON UPPER LEVEL

FILL ON NORTH LOOP

about 16,500 cubic yards of masonry at a unit price of $3.86 per yard. There were 14,000 yards of earth excavation at $1.45 and about 114,000 yards of rock excavation at $3.39.

The rock is a very rough, tough trap formation with irregular seams and much of it badly weathered so that considerable dressing was necessary to remove loose or threatening fragments that might fall onto the road. The numerous vertical seams permitted it to be blasted on very steep slopes, sometimes almost perpendicular, that made for a minimum amount of excavation on the upper side of the road while on the lower side irregularities and steep pockets often made it necessary to excavate to a considerable depth for the footings of the retaining walls.

The slope was so steep, and the surface so rough, that considerable difficulty was encountered in delivering and distributing equipment and plant at the intermediate points of the road, beside which the road was accessible only from the lower end, thus involving an estimated increase of 25 per cent to 30 per cent over the cost of construction had the road been accessible from both ends. In many places the character of the cliff was such that men making the reconnaissance surveys and preliminary drilling and blasting had to be suspended by ropes and work with safety lines and belts.

STEAM SHOVEL WORK

Work was commenced at the upper end of the road at the rectangular intersection with an existing highway where the grades begin with was light and the surface of the ground fairly regular. Three steam shovels were installed and gangs of men with picks, shovels and steam drills operated with compressed air furnished by compressors mounted on the steam shovels, served the shovels that handled the earth, rock and boulders, spoiling them alongside the right of way, delivering to about 40 double-truck 3-yard dump cars hauled by four 12-ton Baldwin and Davenport locomotives on a 24-inch gauge service track laid with 40-pound rails and continued for about a mile along the full length of the road, which was laid as the grading advanced.

As the work progressed the alignment curved to a tangent nearly parallel with the base of the bluff, which it began to ascend on a 5½ per cent grade terraced on the very steep and jagged surface, which was composed of 90 per cent rock with a few trees and shrubs. Most of the rock projections had to be shattered by blasting before they could be detached by the steam shovels. The excavation proper was a cut with a horizontal bottom 20 to 50 feet in width with very steep face sometimes almost perpendicular, on the side toward the hill.

In some cases the spoil was dumped directly alongside the cut, building up a fill on the outer side that widened the grade and diminished the amount of excavation when the topography was such as to provide a suitable bottom for the embankment. At other times the topography was such that it was necessary to make the cut somewhat wider than the required 44 feet in order to trim away all of the loose rock on the hillside, and leave the exposed surface sound and safe.

LOOKING TOWARD LOOP, SHOWING RETAINING WALLS AND SLOPE WALL

RETAINING WALLS

Generally it was necessary to secure the outer side of the roadway by a retaining wall with foundations carried down somewhat below the original surface of the ground to be beyond frost action, and to secure sound rock for bearing. The trench thus excavated varied in width from about 6 to 24 feet, according to the depths, which were from 15 to 55 feet.

Some of the wall was regular retaining wall laid dry with gravity section to resist the pressure of loose stone and earth fill behind it, and some, where the rock, exposed in the hillside was very steep and irregular, was built as a masonry veneer to protect it and provide for the continuity of the wall. In some of these cases the veneer was so nearly vertical that the stones were secured to the face of the rock by 1-inch steel dowels 3 feet long placed 2 feet apart on centers made with split and wedged ends, grouted into the drill holes.

The top of the wall was surmounted by a rub-

ble masonry parapet laid with cement mortar and capped with narrow transverse, horizontal stones 2 or 3 inches apart in the clear, having sharp upper corners presenting a rustic appearance and discouraging the use of the wall as a promenade or seat.

UNDERCUTTING THE FACE OF THE BLUFF

The depth of the cut varied from about 25 feet to 110 feet and it was made entirely by undercutting without the use of any vertical drill holes. A lot of the drilling was done by five large size Ingersoll-Rand jackhammer drills and five Ingersoll-Rand 3¼-inch tripod drills, the latter being operated by compressed air from the power plant established at the lower end of the road, delivered eventually by a 2-inch pipe line extending nearly to the top of the cliff. Holes 15 to 20 feet long were drilled as close to the bottom as possible and were inclined downward from the horizontal about 1 inch in 3 inches. They were sprung, sometimes several times, and finally loaded with 40 per cent and 60 per cent dynamite, which was fired by electricity. On account of the toughness of the rock, its treacherous character, and its irregular seams, the drilling and blasting was very difficult and it sometimes took as much as five days to drill, load and fire a set of four holes which would usually break from 500 to 1,000 yards of rock when shot. The character of the rock made the drills dull very rapidly and made the holes cost up to $1.75 per linear foot.

Because the face of the hill was so high and steep, and because dwellings were built close to the foot of the hill, great precautions were taken in blasting and the charges were covered with rope mattresses and chained logs to reduce danger from the flying stones. Nevertheless, many large stones rolled down the steep incline and landed on private property, but none of them did much damage and no serious accident occurred during the execution of the work. If it had not been for the necessity of safeguarding the nearby residents, the contractor would have followed the alternative plan that he considered, of tunneling under the foot of the slope, making short side drifts, loading them with heavy charges of explosives, and firing them simultaneously so as to bring down vast quantities of rock with a single shot.

ROCK VENEERED WALL, LOWER LEVEL
Face of wall is backed up with concrete, with surface joints left open to imitate dry rubble.

CABLEWAYS

The blasted rock was handled almost entirely by the shovels and by three Lidgerwood cableways of 400 feet span that were installed at successive points over the alignment of the retaining wall to place the stones used in the wall. These stones were of large size, up to 8 tons, and were swung several feet transversely and hauled longitudinally by the trolley hoist of the cableway that was high enough to allow the load to be fleeted fifteen or twenty feet when necessary.

The cableways were shifted forward as required by lowering the 40-foot wooden transverse bents that formed the towers and dragging them forward on the ground by the hoisting engine operating a tackle anchored in advance, after which the tower was easily revolved again to vertical position, guyed and the cableway restored to service after an interruption of about three days, always arranged to include a Sunday, and thus only interfere with two working days. Dynamite was purchased in carload lots and stored in a standard magazine about a mile from the work, from which it was delivered in small quantities daily.

PROHIBITIVE COST OF ROCK CRUSHING

The contractor established a plant with a 15 x 24-inch and a 10 x 28-inch Farrell stone crusher, and a storage bin, engine, boiler, etc., complete, costing about $14,000. With it he crushed about 3,000 yards of stone for the concrete pavement, but the work was made difficult and expensive by the extremely high price of coal, which cost $17 per ton delivered to the crusher, labor was so scarce, costly and inefficient, and the difficulty of transporting stone to the crusher without interfering with the steam shovel service, combined with the intermittent supply, the lack of storage for rock at the crusher and cost of rehandling it, made the cost of crushing the stone as great or greater than that of stone purchased in the open market, although the quality of the trap rock was excellent for concrete or macadam stone. Eventually the contractor sold the stone that was already broken, that was not required at present for the road surface or for local concreting and dismantled the crushing plant.

Besides the plant already mentioned, the contractor installed an Ingersoll-Rand air compressor with a capacity of 850 cubic feet of free air per minute to a pressure of 100 pounds, 6,000 feet of 2-inch air line pipe, 6,000 feet of 1½-inch city pressure water pipe, an 80 h. p. boiler and a Leyner drill sharpener. The maximum force employed was 125 men, the average force about 50, and the average pay, including the laborers, foremen and overtime was $7.75 per day. On May 1 the work was about 95 per cent completed, and it is expected that it will be finished, ready for laying the road surface, within a few weeks. It has not yet been decided what surface will be built, but it is probable that it will be paved with temporary bituminous penetration macadam and after a year or two, when the fill has thoroughly settled, the macadam will be used for a foundation for a hard surface.

New Orleans Inner Harbor

A few weeks ago the city of New Orleans dedicated a harbor and canal which is connected with but not a part of the Mississippi river and is large enough to receive any boats using the river. The question naturally occurs as to why the city should have spent these millions for an artificial water front and channel when it already had the river front and river outlet to the Gulf.

The answer goes back to 1795, when a Spanish treaty was made declaring the banks of the Mississippi river public property not subject to private ownership and development, which treaty was confirmed by the United States at the time of the Louisiana purchase. This made it impossible for manufacturing or commercial interests to build docks and warehouses along the water front, and thus presented a serious handicap to the development of the city's commerce. The new canal running from the river to Lake Pontchartrain will be restricted in no such way and it is proposed that all of the frontage be sold or leased to private interests to be used for docks and warehouses. It was found impossible to secure legislation that would modify these treaties, and New Orleans is confident that the money spent will prove to have been well spent.

This canal, which is now nearing completion, will be 5½ miles long, 30 feet deep below the Gulf, 150 feet wide at the bottom and 300 feet at the surface. There will be a lock at the river 1,050 feet long with 75 feet clear width. This project has been under discussion for nearly twenty years.

This development at New Orleans is only one of the scores that are taking place or are under serious contemplation in various parts of the country, for the development of rivers so as to facilitate navigation and for the construction of canals and harbors. Among the latest of the latter is the letting of contracts for development of a harbor at Wilmington, Dela., which it is estimated will cost $1,750,000 and will include a quay wall 1,400 feet long, sheds, rail connections and yards, etc.

Novel Concrete Bridge Erection

The Wichita Falls Highway bridge has reinforced Pratt truss spans 66 feet long that were pre-cast at the site and then erected as units by a method that was said to secure considerable economy by the elimination of pile falsework and delays that might have been incurred waiting for a favorable stage of the river if other methods had been adopted.

After the completion of its sub-structure a steel through span was erected on it at one end of the bridge, providing a working platform on its floor between the trusses, that was initially and temporarily loaded to produce the same deflection as that caused by the pair of finished reinforced concrete trusses. The loaded floor served as a casting floor on which the permanent trusses were concreted in horizontal position, the floor serving as the bottom of the forms, which only required short vertical side pieces to complete them, thus making much simpler and cheaper forms than would have been required for casting the truss in vertical position.

After the trusses were sufficiently hardened they were revolved to vertical position, seated permanently on their piers and abutments and the pre-cast reinforced concrete floor beams with reinforced bars projecting beyond their ends to form part of the sidewalk cantilevers subsequently concreted, were inserted through the 15 x 42-inch rectangular openings left for the purpose in the lower part of the trusses.

The weight of the steel falsework span was then transferred to rollers on the horizontal top chord of the new span, and the steel span was moved forward and served to support the next concrete span during erection, and so on, until the work was satisfactorily completed by the Jenkins Bridge & Construction Co., Denver, Colo.

Oregon Highway Testing Department

Results of more than a year's work by the State Highway Commission shows a great saving in cost and increase in efficiency of construction.

The Oregon State Highway Commission began organizing a testing department and equipping a laboratory in September, 1919, when Kenneth S. Hall was appointed testing engineer and given charge of the department. It was not possible to obtain equipment until the end of the year, but since January 1, 1920, all testing work has been done by the department.

By far the greatest volume of work of the testing department was in connection with the bituminous mixtures of the various paving plants throughout the state. The field inspection at each plant was handled by a resident inspector whose duties were to see that the operation of mixing and the grading and proportioning in the mixture were according to specifications. Daily representative samples of the mixture were sent by him to the laboratory for analysis. Considerable difficulty was encountered in securing a sufficient number of experienced or capable men for plant inspectors but with careful instruction and frequent visits of the testing engineer to the various plants in the state and of his first assistant to those plants in the vicinity of Salem, the quality of the work was excellent and practically every plant was turning out a well controlled mixture within a few days of its starting operation. Of course, in some cases the varying quality of materials caused trouble but such cases were given an extra amount of care and attention.

In addition to the supervision of the paving plants, scores of sand and gravel deposits, rock quarries, and manufactured products were investigated by this department and advice given engineers on various branches of construction

The laboratory and office were operated under the direct supervision of N. M. Finkbiner, assistant testing engineer, and employed six men during the rush months of June, July, August and September. The work in the laboratory was reduced to an efficient and, wherever possible, to a routine basis so that the greatest possible amount of work was turned out per man per day. The prime importance of service, especially in the case of daily control samples, was constantly borne in mind. Without this service the effort exerted on paving plant control in the field is half wasted. To maintain this service the two men running "hot-stuff" samples turned out as high as forty analyses in a single day and with not more than a half dozen exceptions were "hot-stuffs" allowed to remain until the day following their receipt in the laboratory. With these exceptions the reports of the analyses were in the return mail at night. During the month of July the laboratory turned out an average of 24.5 "hot-stuff" analyses per day.

Another important branch of the work of the department was that of control tests on concrete mixtures carried on in connection with the work of the Bridge Department. The purpose of this work was to adjust the mixtures to suit the conditions and quality of local concrete materials so that a maximum strength concrete can be obtained at a minimum cost, for in many cases the stereotype mixtures usually specified will not give the best results with the available materials. Concrete cylinders were cast on the work, sent to the laboratory and tested. The results then were compared with laboratory tests made and changes in mixture made if necessary. This year the concrete control work has been more or less in an experimental stage but it has shown such promise that in the coming year it will be applied to all concrete work of the state. It will necessitate the installation of some additional apparatus which will well pay for itself in service and improved quality of the work in the field. The other work of the laboratory has been the chemical and physical testing of rock, gravel, sand, cement, paints, pigments and in fact nearly all classes of materials used in highway construction.

The saving effected by the operation of a state-owned testing department has been considerable, as the accompanying table shows. The commercial rates used are in the majority of cases those paid by the state for tests prior to the taking over of the work by the testing department. The testing laboratory expense is its actual running expense plus 20 per cent of the cost of apparatus and equipment. The total installation cost was $2,923.28.

Kind of Test—	No. of Tests	Commercial Rates	Total Cost.
Asphaltic concrete, top	1,272	$5.00	$ 6,360.00
Asphaltic concrete, base	841	5.00	4,205.00
Asphaltic concrete, cut	285	5.00	1,425.00
Rock and gravel	254	5.00	1,270.00
Concrete sand	121	5.00	605.00
Muck sand	51	3.00	153.00
Cement	271 (48,208 bbls)	.03 per bbl.	1,446.24
Asphalt, complete analysis	27	5.50	148.50
Asphalt, penetration	67	1.50	100.50
Miscellaneous (G. I. pipe, paint, oil, etc.)	114	3.75	427.50
Total	3,303		$16,140.74
Total laboratory expense			7,076.27
Total saving			$ 9,064.47

The total expense of the testing department, including the field supervision, general inspection and laboratory expense plus 20 per cent of installation cost, was $16,439.53. This means that we obtained all the tests, general field supervision and inspection and 20 per cent of the first cost of a well-equipped laboratory for $298.79 more than the tests alone would have cost on the old basis. The average cost per test at commercial rates would have been $4.89. The actual average cost was $2.15.

The saving in cost, however, should not be considered as the only benefit derived from the testing department. It has rendered to the jobs in the field more efficient and speedy service than they have ever had before. It has enabled the keeping of a history of the jobs as they progressed so that investigation in the future toward the improvement of the quality of construction will be greatly facilitated. In the future the department will be of great service in passing on local material before a job is advertised for bids, thereby leaving no doubt in the contractor's mind as to what materials will be acceptable. This, in the majority of cases, will tend to lower bid prices and give the best possible job for the money.

Rustic Culvert for Park

In the construction of the Bronx parkway (described in PUBLIC WORKS for October 2, 1920) it was necessary to build a number of culverts to carry under the roadway and to the Bronx river small streams and storm drainage from the high land beyond the road. Several of these had previously been carried to the river in lines of cast iron pipe, and this pipe could have been continued in use for this purpose. It would be necessary, however, to have the upper part of the pipes exposed, which would be unsightly in a park, or else to fill in the land adjacent to the pipes in order to bury them; neither of which alternatives was considered desirable.

The solution adopted in a few cases is illustrated by the accompanying photograph. The cast iron pipe was taken up and part of it relaid in the form of a double culvert under the road, where it was out of sight. At each end of the culvert a rustic face wall was built of stone that was found on the spot, much of it formerly

CULVERT AND CHANNEL, BRONX PARKWAY

used for retaining and slope walls, and from the road culvert to the river an open channel was excavated and was lined on both bottom and sides with large stones, most of them considerably larger than one-man stone. The stones standing at a slight inclination from the vertical along the sides in the illustration are 3 or 4 feet in their longest dimensions, while those in the bottom are most of them a foot or two across. The pavement in the bottom of the open channel is laid in a succession of flat inclines and steps, to produce a pleasing agitation of the water as it flows toward the river. These stones are all too large to be moved by any amount of water likely to pass through the culvert. They are not hammered or dressed, but their surfaces were all weathered and the effect is much more in keeping with the surroundings than would be a wall laid in mortar or even laid up dry.

Gravel Roads in New Hampshire

Study of material in all parts of the state made by testing laboratory, and conclusions as to desirable characteristics.

The 1920 report, which is the 8th biennial report of the state highway department of New Hampshire, shows a continuation of the general policies previously adopted by that department, although naturally developments have been made along certain lines to meet traffic changes. An increased amount of bituminous material has been used for surface treatment, the department having contracted last year for 589,000 gallons of oil and 600,000 of tar. "The department has also used a considerable amount of calcium chloride for a dust layer. The material is considerably less expensive than oil and is quite satisfactory where only a dust layer is necessary." Much more surface treatment has been found necessary for the gravel roads both to eliminate dust and to prevent raveling under the tremendously increased traffic.

"Recently there seems to have appeared an epidemic of poor Portland cement on the market. The number of rejected lots seems to be rapidly increasing. One contractor had four carloads thrown out by the laboratory on account of its inferiority. No really important work should be started until the cement is submitted to the 7 and 28-day tests."

The department's testing laboratory has made an investigation of the gravels of the state in both field and laboratory, this having been begun in 1917, but interrupted during 1918 by the absence of the investigators on war service. Field work has reached practically all towns of the state and samples have been taken from most of them. These include bed rock, field stone, grave', till and rotten stone. Over 450 samples of gravel have been studied. The composition of each sample is found by a careful count of the number of pebbles of each rock type in at least 100 stones, and the resistance to wear has been determined by a modification of the Deval abrasion test.

The laboratory is now in a position to advise an engineer or a local road builder where to obtain the strongest material, whether rock, field stone, or gravel, in any town or district; and when samples are submitted, to judge intelligently of their value without going through the standard tests. Besides forming a basis for future discovery and judgment of materials, this survey has led to the purchasing of a number of local quarries where good road building stone had been unsuspected and of gravel banks that have more than local possibilities.

The annual report describes at considerable length the results of the investigation with valuable suggestions for locating desirable deposits and judging their fitness for use. Nine-tenths of the gravel banks now in use were located by gravel turned up in plowing, excavations for wells and cesspools, post holes for fences or telephone poles or in the preliminary grading of roads. "Even a freshly dug woodchuck hole may point the way to gravel at a place where neither road agent nor geologist would see reason to expect it." However, the locating of gravel has been made something of a science. The topographic form of a gravel deposit may be as reliable a guide to the discovery of a new bank as the showing of gravel on the surface of a freshly plowed field.

Discussing the road building qualities of New Hampshire gravels, the report states that "durability depends in the first case upon the presence of a fair amount of coarse aggregate—that is, stones between 1¼ inch and 2 inches in short diameter. Such stones will support a heavier load than smaller stones or sand. Any gravel in which sand constitutes over 30 per cent of the mixture is best regarded as unfit for use in the surface course, because it will tend to act as a soft cushion through which the stones are pressed. Durability depends directly also upon the strength of the stones that compose the mixture. Pebbles of trap, quartzite, felsite and hard crystalline schists are much more resistant to wear and much tougher than stones of slate or granulated schists or the more crumbly types of granite."

"Ability to stand up under traffic is governed to some extent by the grading of sizes in the mixture. The ideal gravel is one in which all sizes within the specified limits occur in such proportion that the voids are reduced to a minimum."

"The shape of the stones in the aggregate affects the behavior of the mass as it compacts under traffic. Angularity favors compacting, since somewhat angular stones, once wedged against one another, are likely to stay fixed instead of slipping or rotating." Flatness of stones is usually undesirable, since it affords chance for shearing at the joints between them.

The matrix of the mass ultimately consists not only of the sand and clay in the original mixture but also of dust ground or crushed from the gravel under traffic. In the long run, the more durable gravel is more economical, although it may lie

loose on the surface for a season or two before it gives entire satisfaction. Cementing by chemical action depends partly upon the solubility of the particles. Gravels rich in lime carbonate, like those on areas of calciferous schist, are quickly attacked by ground water which carries dilute acids that dissolve the lime carbonate, which is redeposited in adjoining spaces. Some of the gravels in eastern Vermont are so rich in lime carbonate that they have been deeply, though irregularly, consolidated while still in the bank. When laid on the road and packed by traffic, particularly in wet weather, these gravels set almost like Portland cement; and although the stones in them are very soft, the compacted gravel makes a road that holds up under traffic much better than some roads built of stronger material.

"The cementing of gravel by colloids is less thoroughly understood and many theoretical problems are involved. The grinding of gravel under traffic produces much impalpable powder. Some of this has peculiar adhesive properties which class it as colloidal."

The only way to judge the grading of gravel is to study it closely at the bank where as much material as possible is exposed to view. It is impracticable to secure a sample which will be even approximately representative of the grading of the entire bank. If the examination of the bank reveals the fact that parts of the deposit are too sandy or too cobbly, there is no practical solution but to have a vigilant inspector at the bank who can insist on the right material being selected or a satisfactory mixture being obtained. This is a field and not the laboratory problem.

The report states that the abrasion test has given the best-known standard for judging the durability of gravel in every case, but that the laboratory has sought to check this information by personal inspection of roads where the gravel has been used and by conference with division engineers or local road agents. The facts and opinions thus determined are kept on file for future reference in the form of loose-leaf notes.

Fire Engine Pumps Public Water Supply

At Clintonville, Wis., during a recent electrical storm the electric motors used in the city's pumping station for operating the pumps were burned out. These pumps raised water for the city's supply into a tower which is about one mile from the pumping station and 164 feet higher. In the emergency, while the pumping plant was being put back into service, a fire truck (built by the Four-Wheel Drive Auto Company) was brought to the plant, the suction hose lowered into the suction well and two lines of hose connected to the pipe lines inside the pumping station. The fire engine then pumped water from the well into the system by means of its 500-gallon engine and managed to maintain service until the regular plant was in operation.

Florida State Highways

The Florida Engineering Society was organized only about four years ago, but has 178 members and appears to be flourishing and active and is a most useful agent for securing advancement of the best interests of the profession in the state. In its latest convention, last February, a paper was read by one of the members calling attention to the condition of the state highway department and the state highways which was far from commendatory. The aim of the criticism was apparently constructive rather than destructive, however, as the author urged the society to co-operate towards securing legislation and a reorganization of the department more favorable to the proper construction and maintenance of the state highways.

The state highway department was created in 1915, but apparently little was done for or by it before the war. In 1919 it seemed desirable to change the law so as to pay four of the five members of the highway board a salary of $50 a month, and the chairman one of $4,200 a year. Apparently, however, the duties of the chairman and of the state highway engineer were not well defined, and from that time on there was conflict of authority. The state highway engineer had no authority to reorganize the engineering force or even to make the most trivial decision without the consent of the chairman. The field engineers had to refer all details of their work to the chairman. In only a few instances had the location been completed and many miles of work were cleared and

FIRE ENGINE PUMP SERVING TEMPORARILY AS WATER WORKS PUMPING PLANT

grubbed before the grade lines had been established. For several months work was carried on without a profile to show the distribution of materials.

In 1920 about 600 convicts were turned over to the department for use in road construction and were under the charge of men who had not the slightest idea of road construction, and no experienced construction superintendents were employed. Resident engineers had charge of the several districts, but when the convict captains complained about taking orders from them, the chairman of the state board issued an order that the engineers were to stake out the work but have nothing further to do with it.

The engineers were naturally disheartened and dissatisfied and letters of protest and resignation poured into the office. In an effort to improve matters, the chairman appointed the chief clerk as principal assistant engineer in charge of all office work, and his opinions have since then overruled the recommendations of the chief engineer.

"To begin with, there is practically no morale among the employees of the department. Some of the hardest knocks come from men in actual charge of the work." The principal criticisms from the employees are that there is "lack of proper adjustment of salaries paid to the different grades of field men; constant changing of headquarters of field men without regard to family and home conditions of the employees; no direct line of promotion; failure of the department to pay salaries and reimburse expense accounts promptly; delay in honoring requisitions for materials and the ignoring or delay in commenting on reports and answering letters and telegrams."

Contractors complain that it is almost impossible to secure a decision in regard to any questions arising on the work. The resident engineer passes the question up to the division engineer, who, in turn, takes it up with the chief. It then rotates on to the government engineer (if it is a Federal Aid job), then on to the chairman, after which the buck is usually passed back to the resident engineer. After about a month's delay the several engineers and the contractor may get together, when the question is settled. The contractors also resent the failure to pay estimates promptly unless the contractor makes a personal trip to Tallahassee and follows his voucher from one department to another.

These conditions have resulted in an addition to contractors' bids of 35 per cent to 50 per cent to cover cost of Tallahassee expenses, delays, incomplete plans, etc. The public also has complained because the department has promised to construct numerous roads asked for, but has carried out comparatively few of these projects.

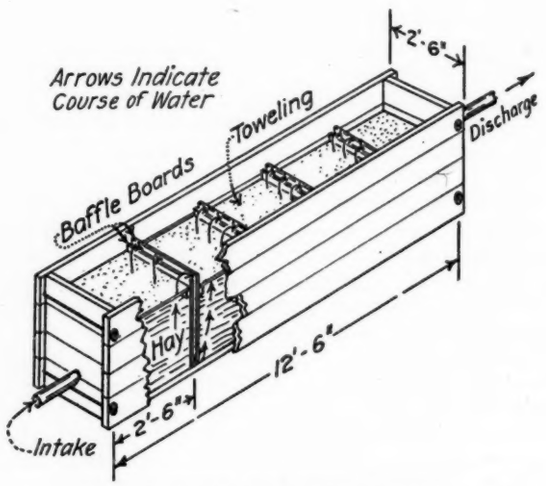
At the end of 1920 a new highway board was appointed. Whether the new board will be able to better conditions and restore confidence, the author of this paper doubted. Lack of money will prevent it from carrying out many of the promises made; in fact, in order to accomplish any real work it will have to concentrate all of its energies and finances on a few of the principal roads.

A Home-made Feed-water Filter

Muddy river water was made satisfactory for boiler use for a tug boat used for river work in the Miami Conservancy District by passing it through a simple filter made by H. A. Hanson, superintendent, and B. H. Tucker, captain of the Miami River Scow and Tug Boat Service.

The filter is contained in a long, rectangular wooden tank, divided into several compartments by double transverse, vertical partitions with a small clearance between the units of each pair, forming a narrow well through which the water passes, entering at the top and leaving at the bottom.

The partitions act as baffle boards, the spaces between which are filled, nearly to the top, with marsh hay covered with turkish toweling nailed on rectangular frames that just fit the horizontal cross sections of the compartments.



HAY FILTER FOR FEED WATER

The intake is at the bottom of the compartment at one end and the water, rising through the hay and the turkish toweling cover, overflows the first of the pair of baffle boards and enters the second compartment through an opening under the second baffleboard of the pair, rising through the hay and toweling, passing down between the next pair of baffleboards, up through the hay, down and up, and so on to the end of the filter, which may consist of as many compartments as is desired, the water finally being discharged through an outlet at the top of the last compartment.

The sediment is deposited in the hay and is strained out by the toweling and the water comes out clear at the discharge end of the filter. The deposition of silt in this filter was so rapid that the first towel screen became clogged and diminished the flow materially in two or three days, so that it was necessary to take out the screens and wash them with a hose and replace them at frequent intervals. This sufficed and the hay required no attention, except to replace it entirely at long intervals.

PUBLIC WORKS

Published Weekly
by
Municipal Journal and Engineer, Inc.
Publication Office, Floral Park, N. Y.
Advertising and Editorial Offices at 243 W. 39th St.,
New York, N. Y.

Subscription Rates
United States and Possessions, Mexico and Cuba....$3.00 per year
All other countries .....$4.00 per year

Change of Address
Subscribers are requested to notify us promptly of change of address, giving both old and new addresses.

Telephone (New York): Bryant 9591
Western office: Monadnock Block, Chicago

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CONTENTS

HEAVY WORK ON A NEW JERSEY STATE ROAD—Illustrated 443
New Orleans Inner Harbor 446
Novel Concrete Bridge Erection 446
OREGON HIGHWAY TESTING DEPARTMENT. 446
Rustic Culvert for Park—Illustrated 447
GRAVEL ROADS IN NEW HAMPSHIRE..... 448
Fire Engine Pumps Public Water Supply—Illustrated 449
Florida State Highways 449
A Home-Made Feed-Water Filter—Illustrated 450
EDITORIAL NOTES 451
Fantastic Bridge Work—The User Should Pay
PNEUMATIC CONCRETE MIXER FOR JAP TUNNEL—Illustrated 452
SERVING CONCRETE PAVING MIXERS FROM CENTRAL STORAGE PLANTS 454
Trackless Trolleys 455
WHAT ARE THE BEST METHODS OF HANDLING GRAVEL FROM CAR TO CONCRETE MIXER? 456
Pennsylvania Highway Work 457
PAVING MATERIALS IN VARIOUS COUNTIES 458
RECENT LEGAL DECISIONS 460

Fantastic Bridge Work

On the principle that everything which goes is a success, the Wichita Highway bridge, noted in this issue, is a success and we have no reason to doubt that it may perform long and honorable service. Its builders are certainly entitled to appreciation for the ingenious manner in which they have applied standard, although little used, methods of steel bridge erection in the construction of concrete spans which is usually executed in a radically different manner. The erection method certainly has the merit of being rational and effective and probably attained greater safety and economy than would have been secured by ordinary concrete bridge erection methods.

The fantastic element is the probably misguided attempt to imitate legitimate steel construction work with concrete which is not adapted to such purposes but is well adapted to an entirely different type of construction, which may be, and generally is, more artistic and efficient than structural steel in cases for which it is specially suitable, one of them often being for the construction of highway spans up to 100 feet in length.

Concrete should be used primarily for mass work, to resist compression stresses, and in combination with steel tension elements for beams, girders and struts, and secondarily as a protection for structural steel. In structural work no tensile service should be imposed on it, and in the highly differentiated stresses of a Pratt truss where half the members are tension members in which there can be no saving whatever of steel, no matter how well the concrete is designed, and in which there are very serious difficulties in detailing and carefully combining the tensile and compressive functions, it is more than doubtful whether a combination of steel and concrete for the principal members can be made advantageous or be justified except as concrete may be used as a purely secondary material for the protection of complete structural trusses.

This criticism does not in the least apply to reinforced concrete arches, arch-rib beams, or girders in which full advantage is taken of the mass, or to independent concrete work, which are not involved in the clumsy concrete truss construction.

It may be claimed that the depth of the trusses could be made smaller than that of concrete arch ribs, thus facilitating the erection by the methods employed but while this assertion would be subject to discussion, it cannot be denied that solid web reinforced concrete girders can be properly made of less depth than either trusses or arch-ribs. It would, however, have been quite possible to arrange for traveling falsework spans that would have supported concrete arch ribs or girders while being cast and allow them later to be revolved into position the same as the trusses were. Furthermore, it has been demonstrated that the reinforcement steel necessary for the reinforced concrete girders and even for some types of arches, is adequate, when properly treated, to form a self-supporting framework that can carry the concrete during the construction of the finished members and thus eliminate other falsework.

The User Should Pay

It is becoming more and more the opinion throughout the country that a large part of the cost of both constructing and maintaining highways should be paid by the owners of motor vehicles. Most of such owners admit the justice of assessing against them a part of such cost, but do not all agree that they should pay the largest part of it.

The question is, of course, a complicated one and the basic principles for providing highway costs have by no means been satisfactorily established. There is this to be said, however, that if the automobile had not come into existence, the amount of money spent on highways since the advent of these vehicles, in excess of the total license fees that such vehicles have paid, would have maintained the old roads for horse travel for many decades to come. Consequently, every dollar spent on highway work for the next 25 to 50 years will have been made necessary by the automobile exclusively.

Reasoning in some such way as this, the highway commissioners of Massachusetts are urging the legislature of that state to adopt House Bill No. 1629 for raising the fees paid by motor vehicles in that stateby an amount which it is estimated will add between $1,000,000 and $2,000,000 to the amounts that would otherwise be paid by automobilists for the state highways. In order to present their ideas to the public and secure a popular support for the measure, the commissioners have published and distributed a leaflet giving some facts, figures and opinions.

In the twenty-seven years since motors began using the highways, the state has spent more than $20,000,000 for construction and $10,000,000 for maintenance, and at the same time the cities and towns have spent more than $180,000,000 for the same purposes; while during this time the motor vehicle operators have contributed in fees less than $11,000,000. During the next ten years $90,000,000 must be spent on highways by the state.

The future improvement consists as much of widening as of strengthening the pavements, the former due to the vast numbers of pleasure automobiles and the latter to trucks. Therefore the fees of the light vehicle as well as those of the truck should be increased. (This point has been overlooked in many discussions of the subject.) Owing to the high cost of maintenance and the continually increasing demands of traffic for improvement in pavements the commission is right, we believe, in arguing for a pay-as-you-go policy instead of piling up bonds for the next generation to pay.

The fees of $15 to $40 proposed for pleasure vehicles and $20 to $150 for motor trucks may seem high; but they are no more than the cost of one tire or a small bill from the repair shop—sums that automobilists pay unhesitatingly several times a year, and which are more than saved them by the improvement of the highways that their fees make possible.

In Massachusetts the automobilists are opposing the increased fees, claiming that more of the road burden should be carried by general taxes, by owners of horse-drawn vehicles and by abutting property. But the bonds issued in the past and the payments already made by abutting property have been sufficient, as already stated, to have maintained the roads for the past twenty years and to continue to maintain them for a great many years to come, had the automobile not added its much more destructive use to the comparatively light wear of the horse-drawn vehicle, and the demand for a construction that costs several times as much as that which sufficed previously.

Laying 273½ Yards of Highway Concrete Per Hour

A well-organized force and well-planned equipment installed on the job enabled McCree, Moose & Co., St. Paul, to concrete 7½ miles of an 18-foot roadway in Minnesota at the rate of 1,094 linear feet, equal to 2,188 square yards of concrete, in one 8-hour shift.

The aggregate is stored at a central mixing plant located 3¾ miles from each end of the 7½-mile section of road under construction. Sand and broken stone are delivered in gondola cars. The sand was dumped to a track pit and then delivered by two belt conveyors to a 20-yard storage hopper over the mixer. The stone was unloaded by 1-yard clam-shell buckets, operated by an 85-foot derrick boom that delivered to a 25-yard hopper bottom storage bin over the mixer and after this was filled delivered the excess to a stock pile on the surface of the ground, from which it could be reclaimed.

The charging hopper of the 1-yard Smith mixer was gauge marked to indicate the proper proportions of sand, crushed stone and cement, the latter being delivered as required in 6-bag batches by a belt conveyor from the store house. The mixer discharged into a 2-yard hopper, from which were filled the 2½-ton end dump short-wheel-base automobile trucks by which the concrete was conveyed to the road, where it was spread with a horse-drawn scraper.

The trucking was facilitated by the sequence of concreting, which was commenced 1½ miles south of the plant and after it had progressed to the plant was recommenced 1½ miles north of the plant working again toward the plant and thus producing a 3-mile stretch of finished hard-surfaced road, over which the trucks traveled to deliver the concrete to the 1⅝-mile section remaining at each end.

Pneumatic Concrete Mixer for Jap Tunnel

Special compressed air machine designed for lining Imperial Japanese Government Railways tunnels.

In January, 1920, three pneumatic concrete mixers, designed for lining the Imperial Japanese Railways tunnels, were shipped to that country from the United States by the Ransome Concrete Manufacturing Company. Each machine has a capacity of about 10 feet of loose aggregate, equivalent to a 7-cubic-feet batch of mixed concrete, per minute, delivered about 100 feet through a 6-inch cast iron pipe by about 1,000 cubic feet of free air per minute at a pressure of 85 to 100 pounds.

The machine, which weighs about two tons, and requires one man to operate it, is mounted on a steel frame truck of 30-inch gauge, intended to run on one of the two tracks laid on the tunnel invert with clearance alongside for muck or material cars to pass it.

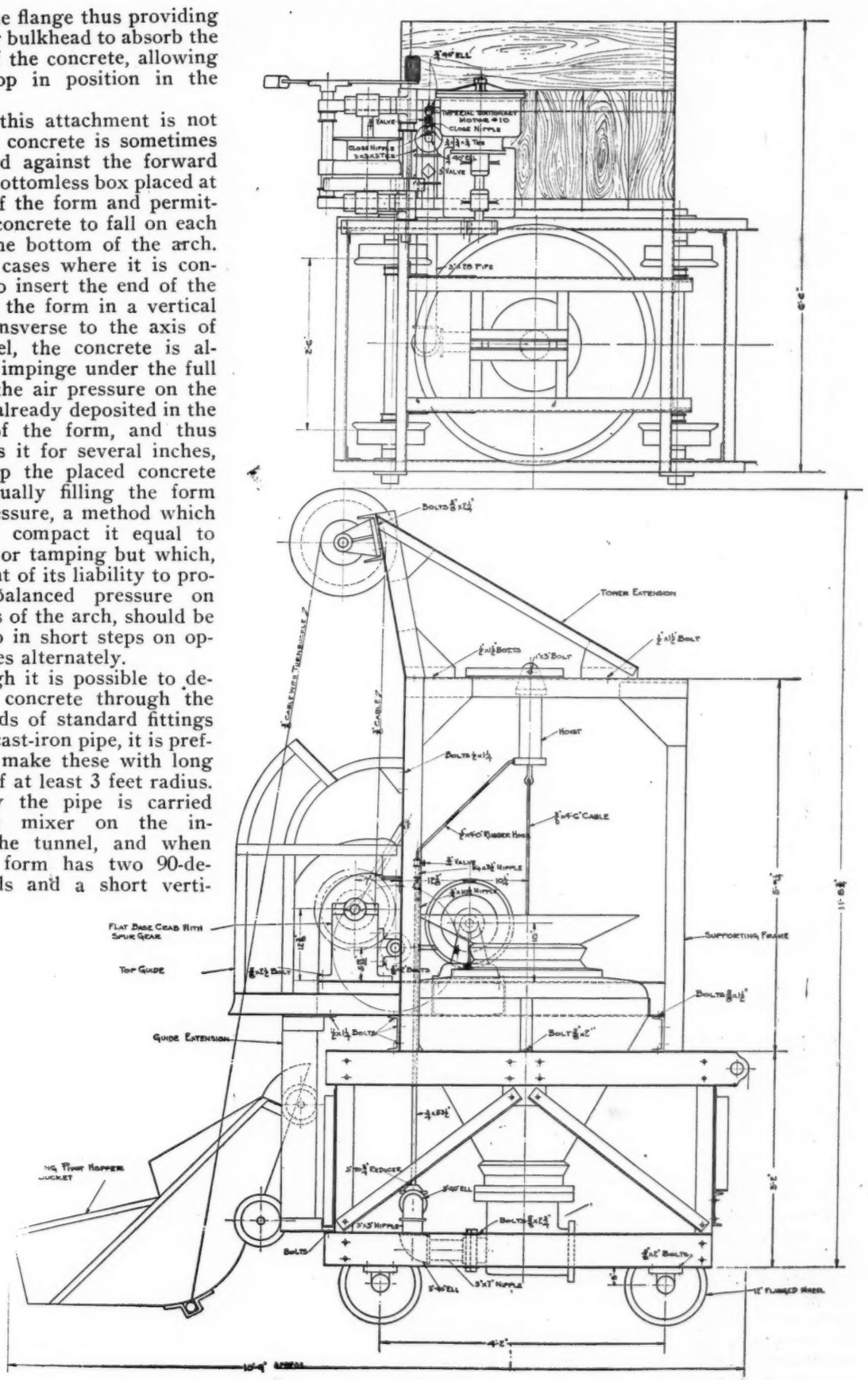
DEPOSITION OF CONCRETE

Although the mixer is capable of delivering concrete 600 feet horizontally and 40 feet vertically, it is preferable to attach it to the rear of the form and move it forward with the form, thus delivering the concrete through a short section of pipe which often terminates with a blank flange and has a hole in the bottom part of the pipe just

behind the flange thus providing a baffle or bulkhead to absorb the impact of the concrete, allowing it to drop in position in the forms.

When this attachment is not used, the concrete is sometimes discharged against the forward end of a bottomless box placed at the top of the form and permitting the concrete to fall on each side to the bottom of the arch. In other cases where it is convenient to insert the end of the pipe into the form in a vertical plane transverse to the axis of the tunnel, the concrete is allowed to impinge under the full force of the air pressure on the concrete already deposited in the bottom of the form, and thus penetrates it for several inches, forcing up the placed concrete and gradually filling the form under pressure, a method which serves to compact it equal to ramming or tamping but which, on account of its liability to produce unbalanced pressure on both sides of the arch, should be carried up in short steps on opposite sides alternately.

Although it is possible to deliver the concrete through the short bends of standard fittings of 6-inch cast-iron pipe, it is preferable to make these with long sections of at least 3 feet radius. Ordinarily the pipe is carried from the mixer on the invert of the tunnel, and when near the form has two 90-degree bends and a short verti-



PNEUMATIC CONCRETE CONVEYOR MOUNTED ON TRUCK FOR WORK IN TUNNEL

cal section which brings it near the crown of the tunnel, where there is screwed into the upper horizontal part the end of a 30-foot length of special heavy 6-inch hose with one-quarter-inch rubber lining and an eight-ply external fabric, making it very stiff and strong. It is provided at each end with a nipple and it has been found that it can be bent in a complete circle or letter "S" and still deliver the concrete satisfactorily and will wear about six times as long as a cast iron bend of the same shape and radius of curvature.

Where it is convenient to maintain a mechanical mixer close to the forms, the mixed concrete can advantageously be delivered to the pneumatic hopper through the power loader hopper, but when the distance is long, the dry aggregate and cement are delivered in batch cars or boxes to the loader hopper and by it dumped into the pneumatic mixing hopper, after which water is added, the hopper closed, the pneumatic pressure admitted, and the mixing almost instantly accomplished.

It is found that the transmission of the concrete through the delivery pipe induces a sort of rolling motion that insures a thorough mixture even in a distance of 20 feet. Care, however, is taken not to allow the concrete to be ejected more than three or four feet beyond the end of the pipe because of the liability to segregation; therefore it is projected as already described against some solid surface equivalent to a baffle board, thence falling by gravity in a homogeneous mass.

JAPANESE METHOD

An interesting feature of the Japanese practice is the method of handling the three-quarter-yard muck and material cars, each of which is provided with a small platform front and rear, on which one laborer rides while two laborers push the loaded car on the tunnel track. At intervals they change places with the man that rides and keep up this practice all day, pushing the cars at the rate of a half-mile trip in six minutes or even less.

The pneumatic machine operated both as a portable mixer and as a concrete conveyor, is especially advantageous for long tunnels where mixed concrete is in danger of acquiring a preliminary set before it can be delivered to the conveyor. In this Japanese work there is a tunnel fifteen miles long that has been designed entirely for use as a service tunnel for the construction of an important hydro-electric plant in a mountain region otherwise inaccessible for the delivery of plant, materials or laborers.

One of these three machines is now in service on the Musachi hydro-electric development under the supervision of Mr. Tsuruta, managing director, who visited America and selected the type of machinery here described. Duplicate parts for the door and lever, the only movable portions of the machine, were shipped with it to provide against delay for renewal. Duplicate parts were also shipped for the air motor and for the power loader. Records of the service of this machine have not yet been received, but a similar machine, with a capacity of ten feet of mixed material and differing only in size, has given a record of 1,753 cubic yards in six 20-hour shifts in the Liberty tunnel, Pittsburgh.

Serving Concrete Paving Mixers from Central Storage Plants

Speed and economy promoted by the use of light automobile trucks with short wheel base equipped with divided end-dump body, or platform with batch boxes, or duplex tilting hoppers.

Route 225 of the Pennsylvania State Highway, between the Baltimore Pike and the Westchester Pike, Delaware county, is five miles long and has a Warrenite surface 18 feet wide laid on a concrete foundation 6 inches deep, except for 1,900 feet, where there is 5 inches of concrete surfaced with brick. Sand and slag were stored in large elevated hopper-bottom bins with gates discharging into measuring boxes under which automobile trucks with their bodies divided by transverse partitions into two equal compartments could be backed and filled successively with the required quantities of slag and sand for two separate batches of concrete and then moved to the adjacent cement house where three bags of cement were added to each batch, the whole operation occupying only 2 or 3 minutes.

Trucks were driven a maximum of three miles over good roads and three miles over heavy subgrade to the mixer, but turned around without difficulty on an 18-foot roadway, the cement bags were emptied on the aggregate and thrown aside to a safe place, the truck backed up, the body tilted by the truck engine and the first batch discharged into the mixer. The truck was then moved forward a few feet permitting the charging skip to be elevated to discharge to the mixer and returned to the ground when the truck backed up again, its body remaining elevated, and the second batch was dumped into the skip and the truck moved away, permitting another one to take its place at the mixer while the first truck returned to the storage bins.

The entire unloading operation for each truck required about two minutes. The work was arranged to keep the trucks constantly in operation. Twenty were used for the long hauls and afterwards, when a second mixer was installed, ten were used for short hauls. The trucks were equipped with 6-inch rear tires that enabled the 11,000-pound maximum load to be carried without difficulty over the sub-grade and the short wheel base enabled them to be turned easily in the 18-foot width of the road. It was estimated that this method of handling the concrete material dry from central storage effected a saving of 16 men, equivalent at current prices to 8 or 10 cents per square yard of concrete. The materials were hauled by Howard B. Greene, Swarthmore, Pa., sub-contractor.

The Weller Construction Co., Washington, D. C., hauled aggregate three or four miles from storage to the concrete mixer on Route No. 127.

Section No. 3, of the Baltimore-York Pike, Pennsylvania, with ten automobile trucks equipped with platform bodies, pneumatic tires and each of them loaded with two steel batch buckets.

Sand, broken stone and cement, delivered by railroad, were handled by clam-shell bucket operated by the boom of a traveling derrick which filled an elevated hopper, under which the trucks were driven and rapidly loaded. The batch boxes were unloaded from the trucks by a power derrick attached to the mixer, and the concrete was laid at a maximum rate of 500 linear feet of 18-foot pavement daily.

On a 9-mile section of the Franklin Canyon Highway, California, Ryan Bros., the contractors, served the concrete mixer with four small automobile trucks with dump bodies that brought the materials from central storage, displacing fifteen large trucks previously employed on the job, because the latter could not turn without backing between the header boards, and were consequently obliged to run beyond the ends of the header boards before the next truck could approach the mixer. In this case the road was built with two 8-foot strips of concrete pavement, separated by a 4-foot strip of macadam.

A 12-mile section of the Jefferson Highway, near Des Moines, Ia., was built with concrete for which the aggregate and cement were hauled from the railroad a maximum of four miles over dirt road and one and a half miles over the subgrade by the Wright Construction Co., which used 1½-ton and 2-ton automobile trucks with platform bodies equipped with Lee end-dump dual-hopper bodies. Each car made the round trip in 14 minutes, so that the six trucks moved a total of 180 tons of dry materials in one 10-hour day.

On all of the above jobs the trucks used were "Autocars" with a 97-inch wheel base, which could easily be handled in cramped positions and were considered speedy, economical and satisfactory.

Trackless Trolleys

Richmond, Va., and Richmond borough, N. Y., Greenville, Texas, and possibly other cities are considering the use of trackless trolleys in place of either street railways or motor busses. In view of the increasing interest in the matter, a practical demonstration of a trolley bus will be made at the Schenectady works of the General Electric Company the latter part of May.

Trackless trolleys have been successfully operated for several years in European countries, more than 100 miles being covered by this service in England, while in Italy 8 companies cover 43½ miles with satisfactory results. Installations of this nature were made in California and in Wisconsin several years ago but for some reason were not adopted.

If used in Richmond, Va., they will serve to supplement the present railway system; while Greenville is considering using them to replace the present rail routes.

The car to be demonstrated at Schenectady is a 30-passenger type, similar in external appearance to the front-entrance, pay-as-you-enter trolley car, except that it has rubber tired wheels. With a sliding trolley pole, the trackless trolley has a practicable width of route of 18 feet, 9 feet on either side of the trolley wire, which gives it ample facilities for passing other vehicles on the street. It is operated similarly to automobiles, steering being done by a large circular wheel and power being applied by a foot pedal. Directly over the head of the driver is a lever by which the trolley pole can be pulled from the wires in passing, where cars are operated in both directions on a single line.

The chief advantage over the regular trolley system is the low initial capital investment, while as compared with the motor bus, the operating and maintenance cost is much less. As compared to a cost of $35,000 a mile for installing a single-track trolley line on an unpaved street, or $75,000 on a paved street, the overhead for a single trackless trolley costs from $5,000 to $7,000 and $2,000 additional for a double set of wires. It is stated that operating a motor bus costs an average of 5 cents a mile for gas and oil, while the cost of the electricity for the trackless trolley is 2 cents a mile. It is also claimed that the maintenance of equipment, including tires, is almost twice as great for the motor bus as for the trackless trolley.

Refuse Collection by Motor Vehicles

A report has been made to the public health committee of the metropolitan borough of Hackney, England, by R. Scorgie, giving data concerning the use of motor vehicles in the collection of house refuse in Sheffield, Nottingham and Leyton. From his study of the services in these three cities Mr. Scorgie has drawn the following conclusions:

That removal of house refuse by mechanically propelled vehicles is advantageous and economical when expedition in collection is obtainable.

That to secure economy by the use of mechanically propelled vehicles for house refuse collection, it is essential that a continuous collection be made and that "waiting time" is entirely avoided.

That electric vehicles are suitable for the work if the conditions of working warrant the use of mechanically propelled vehicles.

The electric vehicles are easy to manipulate and work and are economical in working, but are more costly to purchase than other kinds of mechanically propelled vehicles.

That to secure economy and efficiency by the use of mechanically propelled vehicles in Hackney, the calling at and the entry of the workmen into houses and private premises must be abandoned.

That more frequent collections should be inaugurated, and the occupiers of all premises required to place the refuse in suitable receptacles on the footways or in accessible situations at times to be specified.

That it is expedient that a trial of the use of mechanically propelled vehicles in this district should be undertaken by the purchase of 3 or 4 vehicles before any general scheme is adopted, such vehicles being used in different areas of the borough, with the view to obtaining reliable data of cost under such improved conditions of working as can be adopted in the district.

That the present price of electric vehicles may be approximately assumed to be: 2-ton capacity, £1,300; 3½-ton capacity, £1,600, and that a 5-unit charging station necessitates an expenditure of about £1,500.

Construction Questions Answered

Suggestions as to methods, "wrinkles" and appliances that may be used to overcome difficulties arising in construction work. We invite questions concerning such problems that may arise from time to time in the experience of any of our readers. Answers prepared by competent authorities will be published promptly. It is hoped that others who have solved similar problems differently will send us their solutions for publication also; or describe new "wrinkles." If it is only a new way to drive a nail, it may help some one.

What Are the Best Methods of Handling Gravel from Car to Concrete Mixer?

By gravity alone, when conditions are favorable. By mechanical equipment and gravity combined or by mechanical equipment alone. Clam-shell, orange-peel and even drag-line buckets, derricks, gantries, locomotive cranes, belt and bucket conveyors, elevated bins, dump cars and chutes, are most common items of plant installed. Small amounts can be handled entirely by hand.

(*Continued from Page* 437)

GANTRIES

Cars can be unloaded by a bucket operated from a gantry, which in this case is substantially a trestle bent spanning the railroad track or tracks with vertical and horizontal clearance through it sufficient for the train service and the storage bin or storage pile. In its simplest form it consists of a horizontal beam or girder transverse to the track, supported at each end on a braced or guyed vertical post and having the buckets suspended from it at a sufficient height to permit it to be swung pendulumlike from the car to the storage bin. This, however, would usually be too high for convenience and the bucket may be suspended instead from a trolley running the full length of the horizontal beam and traversed back and forth by a line operated by hand or by the hoisting engine. In this case the beam or girder may be made double with the trolley running between the two parts and it may be supported on A-frames in planes parallel to the railroad track, thus bracing it and giving it independent stability if the A-frames are knee-braced to the cap with inside or outside struts or ties.

The horizontal reach of the gantry may be increased by cantilevering one end of the beam beyond the support provided for the passage of the bucket through the frame while the opposite end of the beam is counterweighted. A gantry can be made fixed or it can slide on skids under the sills of the A-frames or the latter may be provided with wheels or trucks operated on single rails, one on each side of the track. If the gantry is movable the hoisting engine should, of course, be mounted on it.

LOCOMOTIVE CRANES

One of the most convenient and efficient methods of unloading gravel from cars is with locomotive cranes, which, if they are easily available, are equally cheap for handling one carload or a thousand carloads. They are standard equipment for many kinds of construction operations and are very easily shifted from place to place, can be used singly or in multiple, are very flexible in their operation, can be transferred without delay from stock pile to storage bin, and from loading to unloading and from that to reclaiming and can, without extra expense, be interrupted at any time and shifted to any other work without delay or difficulty. The boom is usually long enough to command an elevated storage bin or a stock pile of ordinary size or an extension boom can be easily applied. The cranes may be mounted on trucks to run on standard or special gauge tracks, on board face wheels running on the highway or on caterpillar tractions, with which they can go over very soft, steep or rough ground without roads.

In cases of emergency the work can be performed by derrick cars and by special machines with derricks fitted on portable platforms. The derricks may also be installed on ordinary flat cars if there is a standard gauge track available alongside the track on which the gravel cars are delivered.

BELT AND BUCKET CONVEYORS

The gravel car may discharge directly by dumping or indirectly by buckets to a track hopper or other hopper, in which is installed the boot of a bucket elevator, or which delivers through a hopper bottom to a belt conveyor. The bucket elevator is usually operated on a steep incline and carries the gravel to an elevated storage bin, or can dump it to an elevated hopper from which it is discharged on a storage pile or to a chute or conveyor that will transfer it horizontally. The bucket elevator can be of any reasonable dimensions, usually from 20 to 50 feet in length. It is driven by any convenient motive power and can be had in commercial sizes and types with buckets of different pattern and capacity.

Belt conveyors can be purchased of the manufacturer with various widths and length, and can

be installed in any position from horizontal to an incline of 20 degrees or more from the horizontal. They should be troughed to secure maximum capacity, and are driven by any convenient motor power. They can be purchased in any required length from 10 feet upward, and can usually be most advantageously installed with one or more horizontal or inclined sections 25 to 50 feet long, thus providing a very flexible system for conveying the gravel in any direction and to any elevation.

If provided with a system of regular uniform feed they are automatic in operation, and like the bucket elevator, have a tremendous capacity and afford very economical service if operated continuously. They can be made to deliver at the end of the line or at any intermediate point and like the bucket elevator, can deliver into one or several different compartments of the storage bin.

Belt conveyors may be operated from storage pile to storage bin when the former is not provided with hoppers if the belt is installed in a tunnel passing under the full width of the pile and having horizontal gates in the roof of the tunnel through which the gravel can be delivered to the belt from any part of the pile thus commanded. Ordinary arrangement permits most of the pile to be reclaimed with very little reshoveling.

STORAGE BINS

Storage bins should, if possible, be located adjacent to the mixer at the point where the batch boxes are filled. They can be made of any convenient type or dimensions. If they are not designed and located so that the concrete mixer can be supplied by gravity directly from the main storage bin, there should be a small storage bin above the mixer so that its contents can be discharged by gravity directly into the charging hopper unless the mixer is supplied with gravel furnished in measuring boxes.

For providing a direct supply to the mixer, measuring boxes or to cars or trucks, the storage bin should be elevated to deliver the gravel by gravity when the proper valves or gates are opened. The bins, with vertical walls and open tops, are usually of heavy timber construction, and are divided for storage of sand and gravel, or for gravel of different dimensions. In severe climates where concreting is to be carried on in freezing weather, steam coils may be installed in the bottom of the bin to prevent the wet gravel from freezing.

If the bottom of the bin is made horizontal and the gravel delivered through gates or valves in the bottom or at the lower edge of one or more vertical walls, a little shoveling will be necessary to discharge all of the gravel in the bottom of the bin. This is not, however, usually an important consideration, because the gravel will automatically take a natural slope, delivering most of the contents of the bin without difficulty, and as the bin is constantly replenished only a very small amount of the gravel handled is actually dead material, and the expense of special bin bottom construction and the loss of maximum storage space is unnecessary.

GATES AND VALVES

The gravel can be discharged through rectangular openings at the bottom or lower side of the bin that are commanded by sliding steel gates operated by levers. Care must be taken not to make the surface of the gates too large or the pressure and frictional resistance will make their operation difficult. The gate should work against steel or iron bearings that are well lubricated with heavy grease. Special steel or cast iron gates or valves suited to all sorts of bins and requirements of delivery can be purchased.

If the gravel is discharged through an opening in the vertical wall of the bin its flow can be effectively controlled by means of a trough of any required length that is pivoted at the upper end to the wall just below the bottom of the opening and can revolve in a vertical plan with the upper end of the trough engaged between a pair of vertical wing plates forming the sides of a short fixed trough or spout. The pivoted trough should have the outer end suspended and balanced by a counterweight so that it can easily be revolved upwards, cutting off the flow of the gravel through the opening, and readily dropped downward to any convenient position, regulating the rapidity of the flow of gravel into the bucket, car, or hopper receiving it. Such a home-made arrangement can easily be installed to deliver the gravel several feet away from the bin.

Fixed spouts may be attached to the openings in the storage bin and provided with double gates enclosing between them a space sufficient for one batch of gravel. The gates can be connected so that one is always closed when the other is open, and thus their operation automatically discharges a measured quantity of gravel every time.

If a separate storage bin is required for the mixer it is advantageous to have it located so that it can be filled by gravity with gravel chuted from the main storage bin. If the gravel is discharged through openings in the side of the bin a space under the bin floor may be enclosed and used for storage or other purposes.

Pennsylvania Highway Work

Highway work has started with a good impetus in Pennsylvania, the State Highway Department reporting on May 12 that it had completed 39.44 miles of durable construction in various parts of the state this year. This is more than double the construction for the same period in 1920.

Survey of the state disclosed a large number of unemployed men in every community, which number is increasing weekly. "The highway department is anxious to relieve this situation insofar as the contracts under its direction will afford employment. In view of the fact that practically all communities are affected alike and that there is available a local supply of labor for all our existing contracts, our contractors are being urged to seek the services of men living in the community in which they are operating rather than to import labor from a distance; and especially are they being urged not to interfere with such labor as is, or will be, employed on farms of the commonwealth."

Paving Materials in Various Counties

Reports from hundreds of counties throughout the United States telling where contractors can obtain stone, gravel and sand that will be satisfactory to county engineers for use in concrete, macadam and gravel road construction.

In connection with other data collected by us from county highway officials during March of this year was information concerning the availability in each county of stone that would be acceptable for either concrete or macadam, gravel acceptable for either of these purposes, and sand for concrete. In each case the question was whether such material could be obtained within the county, and if not, how far it was to the nearest quarry or bank from which such material could be obtained. Our idea was that this information would be valuable to contractors who might at any time contemplate bidding upon highway work in any of these counties. In a general way also, it gives a survey of the local material situation throughout the country, which may aid in explaining cost prices, the reason for adopting certain classes of construction in a given county, and in other ways.

In the following we have given the answers returned from the several counties in as condensed a form as possible, at the same time endeavoring to so present the matter that it can be referred to conveniently.

The questions asked are given herewith and, in giving the replies, each will be referred to by the letter attached to it in this list:

A. Are there any quarries in the county from which can be obtained stone acceptable for concrete?

B. For macadam?

C. If not, how far is the nearest quarry?

D. Are there any banks in the county from which can be obtained gravel acceptable for concrete?

E. For gravel roads?

F. If not, how far is nearest bank?

G. Are there banks in the county from which can be obtained sand acceptable for concrete?

H. If not, how far is the nearest bank?

ALABAMA

Calhoun—A yes, B yes, D yes, E yes, G yes.

ARKANSAS

Conway—A yes, B no, C 50 miles, C yes, E yes, G yes.
Jackson—C 100 miles, D river gravel banks, G yes, river bar sand.
Monroe—A no, B no, C 150 miles by rail, D yes, in abundance, E yes, well distributed, G yes.
Montgomery—A yes, B no, C 90 miles, D yes, E yes, G yes.
Pike—A no, B no, C 50 miles, D no, E no, F 50 miles, G yes.
Lincoln, Drew, Desha, Chicot and Ashley—A none, except sand and gravel from Mississippi river, B some bank deposits, D no, E yes, G no.
Polk—A yes, B yes, D river gravel, E no, F 60 miles, G river sand.
Pulaski—A yes, B yes, D no, E no, F 43 miles, G yes.
Scott—A yes, B yes, D yes, E yes, G yes.
Seveier, Saline and Lincoln—A no, B no, C by rail average 100 miles, D yes, in all cases, E yes, G yes in all, H every few miles.
Van Buren—A no, B no, C 40 miles, D no, E no, F 100 miles, G no, H 100 miles.
Washington—A yes, B yes, D few, E yes, G no, H 60 miles.

CALIFORNIA

Fresno—A yes, B yes, D yes, E yes, G yes.
Glen—A yes, B yes, D yes, E yes, G yes, sand tests 23 per cent stronger than Oaaowa sand.
Madera—A no, B yes, D yes, E yes, G plenty in different places.
Riverside—A yes, B yes, D yes, E yes, G yes.
San Benito—A yes, B yes, D yes, E yes, G yes.
Solano—A yes, B yes, D yes, from creek beds, E yes, from creek beds, G yes, from creek and river beds.
Sutter—A no, B no, C 40 miles by railroad, D no, E yes, G yes, river run. H screened sand in adjoining county.
Ventura—A no, E yes, G yes, H river beds.

COLORADO

Elbert—A no, C 60 miles, D plenty of sand, E yes, F handy to mostly all roads, G yes, H handy to mostly all places where needed.
Fremont—A yes, several. D yes, several, G yes, several.
Lake—A plenty of them, B yes, D yes, E yes, G yes.
Logan—A none, B none, E yes, G yes.
Ouray—A abundance of sand and gravel, B lots, D yes, E yes, G river sand.
Rio Blanco—A yes, B yes, D yes, E yes, G yes.
Rio Grande—A yes, B yes, D yes, E yes, G yes.
Routt—A yes, B yes, D yes, E yes, G yes.
Weld—A no, B no, C 50 miles, D yes, E yes, G yes.

CONNECTICUT

Litchfield—A none, B none, C 50 miles, D yes, E yes, G yes.
Fairfield—A no, B no, C New Haven, D no, E only fair, F doubtful, G no, H Long Island.
New Haven—A yes, B yes, D yes, E yes, G yes.
New London, Windham, Tolland—A yes, B yes, D yes, E yes, G yes.

DELAWARE

New Castle—A yes, B yes.

FLORIDA

Bay—A no, B no, C no, D adjoining county, E adjoining county, F county owns 320 acres adjoining county, G yes.
Bradford—A none, B no, C 50 miles, D yes, E yes, G yes.
Duval—A no, B no, C Columbia, S. C., D no, E no, F Montgomery, Ala., G out of river, H sand generally shipped in haul 50 to 150 miles.
Escambia—A no, B no, D yes, E yes, G yes.
Flagler—A yes, rock, D no.
Pinellas—A no, B no, C 75 miles, D no, E no, F 150 miles, G yes, limited quantities, H Lake Wier sand 100 miles, Alifia river sand 25 miles, both pass government specifications.

IDAHO

Ada—A yes, B yes, D lots of them, E lots of them, G yes.
Bannock—A yes, B yes, D yes, E yes, G yes.
Benewah—A none opened, plenty available, B none, plenty available, D no quantity, E no, F 60 miles, G yes, fair.
Boise—A no, B no, D yes, E yes, G yes.
Butte—A yes, B yes, D yes, E yes, G yes.
Caribou—A yes, B yes, D yes, E yes, G yes.
Custer—A yes, B yes, D yes, E yes, G yes.
District No. 1, Bureau of Highways—A yes, B yes, except Bear Lake, D yes, E yes, except Bear Lake, G yes.
Idaho—A yes, B yes, D yes, E yes, G yes.
Power—A yes, B yes, D yes, E yes, G yes.
Washington—A yes, D yes, E yes, G yes.

ILLINOIS

Adams—A yes, B yes, D no, E yes, G yes, H plenty of good sand and gravel in Mississippi river.
Calhoun—A unlimited amount of limestone bluffs, B same, D none, E creek gravel, G none, H Mississippi river and Illinois river sand.
Carroll—A 3 in use, B 3 in operation, D yes, E yes, G yes.
Christian—A no, B no, C 90 miles, D no, E yes, G no, H 70 miles.
Clark—A plenty of limestone, no quarries working, B no, C 50 or 60 miles, D yes, E yes, G yes.
Coles—A no, B no, E yes, F 80 miles, G no, H 80 miles, Terre Haute, Ind.
Crawford—B none, C 5 miles, D yes, E yes, G yes.
DeWitt—A no, B no, D no, E yes, G no.
Fulton—A yes, B no, D natural deposits, E yes, G yes.
Henderson—A yes, B yes, D no, G yes.
Jackson—A yes, B yes, D yes, E yes, G no, H 26 miles.
Jasper—A no, B no, C 150 miles, D no, E no, F 35 miles, G none, except bars along river, H 35 miles.
Jersey—A yes, B yes, D no, gravel in creeks, G no banks, but good gravel in creeks.
Kane—A no, B yes, D yes, E yes, G yes.
Madison—A yes, B yes, D yes, E yes, G yes.
Marion—A no, B yes, D yes, E yes, G yes.
Massac—A in infancy, B same, C White Hill (20 miles), D 50 open pits, E numerous, F numerous, G numerous, H numerous.
McDonough—A none, B none, D none, E no, G no.
McHenry—A no, B no, C 2½ miles west of county line, D yes, great many, E yes, great many, G yes.
Monroe—A yes, B yes, D no, E no, G no.
Piatt—A no.
Pike—A unlimited quantities, B stone pretty soft, C some good local quarries, D from streams, but must be washed, E from streams, unlimited, G yes, but must be washed.
Pulaski and Alexander—A limestone deposits, B not being worked, C 18 miles (White Hill), D numerous ones, E numerous, G river bars only.
Richland—A no, D none, G yes, H several creeks with good sand from 3 to 5 miles.
Saline—C 90 miles, D no, F 40 miles, H 40 miles.
Schuyler—A no, B no, D yes, E yes, F located at Frederick, G yes, H on railroad.
Scott—A no, B no, C 25 miles, D yes, E yes, G yes.
Stephenson—A no, B yes, C for concrete 75 miles, D about 3, E yes, G yes, pit run.
White—A no, B no, C 60 miles, D river gravel along boundary, E along boundary, G no, H along boundary.
Williamson—B no, E no, G no.
Woodford—A no, B no, C 100 miles, D no banks, some wash gravel in stream beds, E none accepted by state, F 25 miles, G yes, if washed.

INDIANA

Clinton—A none, B none, C 25 miles, D yes, E yes, F most concrete material shipped 25 miles, G yes.
Crawford—A yes, B yes, D none except in river, E in river only, F none accessible, G from Ohio river.
Decatur—A yes, B yes, D no, E yes, G no, H 25 miles.
Dubois—A yes, in north end of county, B yes, in north end of county, C for work other than north end stone is shipped about 40 miles, D yes, along White river on north end, E no, F 55 miles for south and central sections, G along White river on north end, H for south and central portions 55 miles.
Fulton—A none, C 23 miles, D yes, E yes, G yes.
Hendricks—A none, B none, C train 30 miles, truck 15 miles, D little creek gravel, but all should be screened and most washed, E yes, G no, H washing plants 20 miles away.
Howard—A yes, B yes, D no, E yes, G no, H 30 miles.
Jackson—A yes, west part, B yes, west part, C 2 to 20 miles, D no, use White river, E bank and river, F 1 to 10 miles, G White river, H none, use White river.
Jennings—A yes, B yes, D no, E no, G sand and gravel are obtained, H from streams for concrete.
Madison—A yes, B yes, D yes, E yes, G yes.
Martin—A plenty of them, B yes, D yes, E yes, G east fork White river furnishes all that will be needed.
Montgomery—A no, D yes, E yes, G yes.
Morgan—A yes, B yes, D yes, E yes, G yes.
Newton—A yes, B yes, D yes, E yes, G yes.
Orange—A yes, B yes, D yes, for small contracts, E no, F 30 miles, G no, H 30 miles.
Posey—A no, B no, C 90 miles, D yes, E yes, G yes.
Putnam—A plenty, B several, C in all townships, D several and creek bars, E several, F we ship some gravel, G generally use washed bar gravel.
Ripley—A yes, B yes, D none, E yes, G yes.
Shelby—A yes, B yes, D yes, abundant fine gravel, E Yes, G yes.
Spencer—A no, B no, C 50 miles, D no, E no, F Ohio river adjoins county, G no, H Ohio river adjoins county.
St. Joseph—A no, B no, C 60 miles, D yes, E yes, G yes.
Tippecanoe—A no, B no, C 30 miles, D yes, E yes, G yes.
Vigo—A no, B no, D yes, E yes, G yes.

IOWA

Allamakee—A yes, B yes, D yes, E yes, G yes.
Appanoose—A no, B no, C 90 miles, D no, E no, F 45 miles, G no, H 45 miles.
Beton—A yes, B yes, D yes, E yes, G yes.
Bremer—A no, B no, C 100 miles, D very few, E some, G no, H 30 miles.
Buena Vista—A no, B no, C 100 miles, D yes, E yes, G yes.
Cass—A no, B none, C none in southwest Iowa, D none, E none, F Lake View or Des Moines, G none, H Lake View or Des Moines.
Cedar—A yes, none in operation, B yes, none in operation, D sand in Cedar river, E none, G sand in Cedar river.
Cerro Gordo—A yes, B yes, C 2 miles, D yes, E yes, F 2 miles, G yes, H 2 miles.
Chickasaw—A yes, B yes, D yes, E yes, G yes.
Clay—A no, B no, D yes, E yes, G yes.
Crawford—A no, B no, D yes, E yes, G yes.
Dallas—D yes, E yes, G yes.
Delaware—A none, B yes, D yes, E yes, G yes.
Des Moines—A yes, but not paving concrete, B yes, D yes, Mississippi river, E yes, F Muscatine, Ia., G yes, Mississippi river, H Muscatine, Ia.
Dickinson—A no, D yes, E yes, G yes.
Dubuque—A yes, B yes, D no, E no, G Mississippi river gravel.
Emmet—A no, B no, D yes, E yes, G yes.
Floyd—A yes, B yes, D yes, E yes, G yes.
Grundy—A yes, all limited, B yes, D no, E yes, G yes.
Guthrie—A none, B none, D no, E yes, F 30 miles, G yes.
Hamilton—A none opened up, B none open, C 30 miles, D yes, E yes, G yes.
Harrison—B none, C 100 miles, D yes, E yes, F 75 miles, G yes, H 75 miles.
Iowa—A no, B none, C 70 miles, D no, E no, F 70 miles, G yes.
Jasper—A no, C 90 miles, D no, F 35 miles.
Johnson—A yes, B yes, D no, F 75 miles, G river.
Kossuth—A no, B no, C 20 miles, D no, E yes, F 20 miles, G no, H 20 miles.
Linn—A yes, B yes, D yes, but it must be washed, E yes, G yes.
Lucas—A no, B no, C 60 miles, D no, E no, F 50 miles, G no, H 60 miles.
Lyon—A yes, B yes, D yes, E yes, G yes.
Madison—A abundant supply, B yes, C along road site, D no, E no, G no, H 15 miles.
Mahaska—A no, B no, D no, E one, G no.
Marshall—A county owns one, B yes, D yes, E yes, G yes.
Monona—A no, B no, D no, E yes, F 70 miles, G yes.
Monroe—C at northeast corner.
Montgomery—A no, B no, C 75 miles, D no, E no, F 100 miles, G no, H 75 miles.
Muscatine—A no, B no, D yes, E yes, G yes, H yes.
O'Brien—A no stone, but fair quantity of good gravel and sand, C 60 miles, D yes, E yes, G yes.

To be continued

Recent Legal Decisions

EXEMPTION FROM TAXATION OF MUNICIPALITY'S ELECTRIC PLANT SITUATED WITHOUT THE MUNICIPALITY LIMITS

The Connecticut statute, Gen. St., 1918, par. 1160, provides that buildings with their appurtenances belonging to any county, town, city or borough "shall be exempt from taxation." The Connecticut Supreme Court holds that in the light of the common law this provision should be treated as if it exempted from taxation all property held by municipalities for public use. It is the recognized law that the furnishing of electricity to the public for light, heat and power for pay is a public use for which the power of eminent domain may be exercised. It is now the common law of Connecticut, and in substantially all the states, that a municipality which, acting under legislative authority, maintains and operates a public service plant and furnishes water or gas or electricity, for light, heat and power to itself, and to its inhabitants for pay, holds such plant for a public use. The great weight of authority holds that such a plant is exempt from taxation wherever situated within the state of the municipality. Applying these principles it is held, Town of North Haven v. Borough of Wallingford, 111 Atl. 904, that a municipality's electric plant is exempt from taxation though located in another part of the state. Where the defendant borough acquired, from plaintiff town, for its electric plant, water power and land on which stood a gristmill, on condition that the mill was kept fit for service, the running of the mill as an incident to the maintenance of the water power, and the mere receipt of a triflng revenue which went into the borough treasury did not render the mill subject to taxation.

REGULATION OF RAILROAD CROSSINGS BY A CITY WITHIN ITS LIMITS

The Florida Supreme Court holds, City of De Funick Springs v. Louisville & Nashville R. Co., 87 So. 47, that where a railroad is operated over a street that divides the city into two parts, so that it is impossible for the public to go from one part to the other without passing over the railroad tracks and right of way, the city, under its police power, for the protection of the railroad and the safety of the public, may prohibit the passage over the railroad tracks and right of way by the public except at such points as the city may designate, and may require the railroad to provide safe and convenient means of passage at such places. The public has a right to go from one part of the city to the other, and this right is superior to the right of the railroad to maintain its tracks and operate its trains through the city. The city council has the right, in the exercise of a sound discretion, to determine at what points the public shall cross the right of way and tracks, and may establish such points as are required for the convenience of the public in the transaction of its business or for such other purposes as are common to the inhabitants of a city.

CONTRACTORS INDISPENSABLE PARTIES TO SUIT TO RESTRAIN CITY FROM COMPLYING WITH CONTRACT

In a suit by taxpayers to enjoin a city making payment to contractors, the Texas Court of Civil Appeals holds, 227 S. W. 505, that the contractors are indispensable parties to the suit, its sole object being to have the court declare their contract with the city invalid and restrain the city from complying with its terms; and the court cannot do this so as to bind the contractors unless they are parties to the suit. It is also held that the Appellate Court must take notice of the fact that they are not made parties though the point has not been raised in either the trial or the Appellate Court.

REGULATION OF MUNICIPALLY OWNED PUBLIC UTILITIES

The Indiana Public Utilities Commission is of opinion that Section 112 of the Public Service Commission Act makes unlawful free service or service at special rates to any consumer of a municipal utility, and that the practice of furnishing free service, or service at special rates, therefore, has been unlawful since the passage of the act in 1913. Whether a town could recover from a charitable institution bills for water and electricity furnished by the municipal plant, dating back to the passage of the act, is a question of law over which the commission has no jurisdiction.

The Indiana Commission is of opinion that where a municipality owns and operates water and electrical utilities, the municipality should have on file with the commission rates for both street lighting and fire hydrant service, and that the amounts due under its rate schedules should be paid by the municipality to the utilities in cash, and credited to the utility as revenue; the funds necessary to make such payments to the utilities to be raised by taxation.

EXTENSION OF WATER MAINS

On the complaint of the borough of Tionesta and a number of individuals as to the failure of the Tionesta Water Supply Company to make an extension of mains, to which the company objected on the ground that the resulting revenue would not be sufficient to justify the expenditure required, it appeared that the extension would not only be a public convenience to a considerable number of prospective water consumers, but was a real public necessity from the standpoint of fire protection. It was admitted that the prospective returns upon the investment would not be sufficient of themselves to meet reasonable annual charges placed upon the extensions at present, but the Pennsylvania Commission held that, as it did not seem that the burden upon the general revenues of the company would be oppressive or unreasonable, the extension should be made, provided the borough on its part arrange for sewerage.

NEWS OF THE SOCIETIES

May 31-June 3—NATIONAL ELECTRIC LIGHT ASSOCIATION. Pasadena, Cal.

June 1-2—CONFERENCE OF STATE SANITARY ENGINEERS. Hotel Bellevue, Boston, Mass.

June 2-4—GOVERNMENTAL RESEARCH CONFERENCE. Philadelphia, Pa. Secretary, Dr. L. D. Upson, 542 Griswold st., Detroit, Mich.

June 3—AMERICAN ENGINEERING COUNCIL, FEDERATED AMERICAN ENGINEERING SOCIETIES. St. Louis.

June 5-16—TRI-STATE WATER AND LIGHT ASSOCIATION. Asheville, N. C. Secretary, W. F. Seitglitz, Columbia, S. C.

June 6-10—AMERICAN WATER WORKS ASSOCIATION. Annual convention, Hollenden Hotel. Cleveland. Secretary, J. M. Diven, 153 W. 71st st., New York City.

June 7-10—KENTUCKY STATE ROAD ENGINEERS. Annual convention. Armory, Louisville, Kentucky.

June 10—ROCHESTER ENGINEERING SOCIETY. Annual meeting. Election of officers. Rochester Engineering Society Rooms.

June 13-14—CLEVELAND SECTION AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Regional meeting. Great Lakes Territory. Hotel Statler.

June 14-16—NATIONAL FIRE PROTECTION ASSOCIATION. Annual meeting. San Francisco.

June 15-17—LEAGUE OF MICHIGAN MUNICIPALITIES. Annual Convention. Kalamazoo, Mich.

June 17—PHILADELPHIA SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS: Outing at Howard McCall Field.

June 17—INLAND EMPIRE SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Joint meeting with engineering societies of Spokane.

June 20-24—AMERICAN INSTITUTE OF CHEMICAL ENGINEERS. 13th semi-annual meeting. Detroit, Mich.

June 20-24—AMERICAN SOCIETY FOR TESTING MATERIALS. Annual meeting. Asbury Park N. J.

June 28—ATLANTA SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Election of officers. Georgia School of Technology, Atlanta.

June 28-July 1—SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. UNIVERSITY OF PITTSBURG. Annual convention. New Haven Conn

July 15—NEW ENGLAND ASSOCIATION OF COMMERCIAL ENGINEERS. Annual meeting. Crown Hotel, Providence, R. I.

Aug. 10-12—INTERNATIONAL ASSOCIATION OF STREET CLEANING OFFICIALS. Annual conference. Hotel La Salle, Chicago, Ill

Sept. 28 (10 days)—NEW YORK ELECTRICAL EXPOSITION. Seventy-first Regiment Armory, New York City.

Oct. 11-14—INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS. Annual Convention, Atlanta, Ga. Hotel Ansley. Secretary, James J. Mulcahey, Municipal Building, Denver, Colo

Oct. 24-28—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention. Southern Hotel, Baltimore, Md. Secretary Charles Carroll Brown, Valparaiso, Ind.

Nov. 14-18—AMERICAN PUBLIC HEALTH ASSOCIATION. Annual meeting. Ne wYork City.

AMERICAN SOCIETY OF CIVIL ENGINEERS

The annual convention of the American Society of Civil Engineers was held at Houston, Texas, on April 27, with 140 members in attendance. The net result of the business session was the unanimous acceptance of the constitutional amendments presented by the committee on referred amendments. Several minor changes were made, wihh which exception the committee draft stands.

No other business was considered, but the following announcements were made: That the publication of papers and discussions in the "Proceedings" would be resumed; that a committee be authorized to promote the technical interest and activities of the society; and that a research committee be authorized to stimulate research work.

Addresses were delivered by J. H. Brillhart, Gov. P. M. Neff, Mayor O. T. Holcomb and E. E. Sands; followed by the presidential address by Mr. Webster on the subject of "The Municipal Engineer." The constitution was next discussed by various members and minor changes accepted.

It was announced that Elbert M. Chandler, of Olympia, Wash., chief engineer of the Washington State Reclamation Service, had been appointed acting secretary of the society.

AMERICAN ASSOCIATION OF ENGINEERS

The annual meeting of the American Association of Engineers at Buffalo, May 9 to 11, endorsed the following national activities of engineers:

1. Favoring an engineer on the International Boundary Commission.
2. Favoring a national board of classification for engineering schools.
3. Against laws permitting corporations to practice as engineers.
4. Favoring a census of highway traffic.
5. Favoring a continuance of Federal aid to highways.
6. Favoring Phipps bill increasing Federal Aid allotment in public land estates.
7. Favoring national financing of reclamation work.
8. Favoring sanitary engineers on public board of health.
9. Directing advance copies of annual convention reports be prepared.
10. Favoring a minimum of two weeks' notice by both parties in case of separations in employment.
11. Providing for committee to plan employment service and payment therefor.
12. Favoring increasing the membership from all classes of engineers.
13. Providing a committee to amplify statement of the ideals and objects of the association.
14. Thanking the city of Buffalo and the Buffalo Chapter for the courtesies extended to the convention.

The officers elected for the ensuing year were H. O. Garmon, chief engineer and consulting engineer with the Indiana Public Utilities Commission, president of the association; A. N. Johnson, dean of engineering at Maryland State College, vice-president; A. S. Morris, auditor, capital expenditures, C. & N. W. R. R., second vice-president; E. F. Ayres, Webster L. Benham, Garrison Babcock, Morris Bien, G. M. Butler and W. R. McKeen were elected directors. C. A. Hoglund, C. D. Hartman, W. R. Smith are the new auditing committee.

The most important development of the convention was the outlined program for activities of 200 chapters of the association scattered throughout the country, based upon the various activities of these chapters during the past year, along the lines of employment, civic activities, legislation, ethics, education and compensation.

During the past twelve months the Employment Bureau of the association was instrumental in placing 3,439 men in positions. The employment service of the association is maintained as a free service to its members.

Salt Lake City was selected as the convention city for next year.

The program of the meeting consisted of hearing reports of various national committees, including those on various employment, railroad, industrial, federal, salaries of engineers in public service and in teaching service, water power and conservation, highways and the numerous other activities of the organization.

On the afternoon of the second day a trip was made to Niagara Falls by 130 delegates.

At the banquet on May 10 addresses were delivered by L. K. Sherman, H. O. Garmon and Frances A. Kellar, who spoke on "Americanization and Man Power."

An interesting feature of the convention was the St. Lawrence Waterway, which was discussed by Senator Henry W. Hill, of the New York State, and Dr. F. H. Newell, former director of Reclamation service.

SOUTHWEST WATER WORKS ASSOCIATION

The tenth annual convention was held at the Skirvin Hotel, Oklahoma City, Okla., May 9, 10, 11, 12, 1921. The program included papers on "Sanitary Control of Public Water Supplies," by M. Z. Blair; "Overhauling a Neglected Distribution System," by A. S. Holway; "Rules and Regulations," by W. A. Stanfield; "Surface Water in Oklahoma," by A. R. Lewis; "Water Collections," Miss Adella Martin; Discussion; "Water Works Reports and What They Should Contain," by R. E. McDonnell; "State Supervision of Water Supplies," by V. M. Ehlers; Round Table Discussions, by Superintendents. Open house at Sherman Machine & Iron Works. "How to Get Out Water Bills Promptly," by H. A. Gallagher; "Today's Greatest Needs Essential to Successful Operation," by J. F. Christy. Election of officers and routine business, entertainments for ladies, a dance, reception, banquet, trip to El Reno to inspect the city water works.

CONFERENCE OF STATE SANITARY ENGINEERS

A meeting will be held June 1 and 2 at the Hotel Bellevue, Boston. There will be papers on "Some Productive Activities of a State Sanitary Engineering Office," by Robert B. Morse. "The Typhoid Epidemic at Salem, Ohio," by W. H. Dittoe. "State Sanitation," by Geo. C. Whipple. "The Certification and Supervision of Water Supplies on Interstate Carriers," "Water-borne Epidemics Among Passengers and Crews of Vessels," by J. I. Connolly. "The Policy of the Public Health Service for the Supervision of Water Supplies of

Common Carriers," by I. W. Mendelsohn. "Experiences with the Supervision of Water Supplies on Vessels Plying on the Great Lakes," by A. E. Gorman. "The Co-operation of the State Health Departments in the Certification of Interstate Water Supplies," by E. S. Tisdale. "Supervision of Milk Pasteurization in Minnesota," by H. A. Whittaker. "State Control of Stream Pollution and Sewage Disposal in Connecticut," by J. F. Jackson. "Mosquito Control Work in Arkansas," by M. Z. Bair. "Ratproofing from an Engineer's Point of View," by A. F. Allen.

Reports will be received from committees on water supply, cross connections and by-passes on water supplies, laws, organization, policy and procedure, milk supply, stream pollution and sewage disposal, mosquito control, and on swimming pools.

WESTERN SOCIETY OF ENGINEERS

At the meeting on May 4, the Western Society of Engineers elected the following officers: President, Charles H. MacDowell; first vice-president, Julius L. Hecht; second vice-president, F. F. Fowler; third vice-president, Benjamin S. Shapiro; treasurer, Homer E. Niess; trustee, Edwin W. Allen; and members of the Washington Award Commission, John F. Hayford and Henry J. Burt.

AMERICAN SOCIETY OF SAFETY ENGINEERS

The American Society of Safety Engineers has made application for charter membership in the Federated American Engineering Societies.

NEW YORK SECTION AMERICAN SOCIETY OF CIVIL ENGINEERS

At the regular meeting, May 11, "Bridges and Tunnels in the Metropolitan District" were discussed. Professor William H. Burr, consulting engineer, introduced the subject and J. Vipond Davies, C. M. Holland, chief engineer, New York and New Jersey Bridge and Tunnel Commissions, Gustav Lindenthal, Ralph Modjeski, J. F. O'Rourke and J. A. L. Waddell participated in the discussion.

PERSONALS

Ripley, Theron M., of Watertown, N. Y., former division engineer at Hornell, N. Y., has been reinstated by Commissioner Sisson. To make room for him, Perry Filkin has been transferred to the Buffalo division office; and Squire E. Fitch, who has been serving as division engineer in Buffalo, will return to his former position as superintendent of maintenance covering the western half of the state.

Reed, William B., of Weedsport, has been appointed third deputy to Highway Commissioner Herbert S. Sisson.

Moloy, Robert J., who has been with the New York State Highway Commission for the past two years, has resigned his position and will take up his new duty as examiner in the New York office of the State Insurance Department.

Benedict, B. W., has resigned as city engineer of Lockport, N. Y.

Shulde, H. G., has been appointed district engineer of the Pennsylvania State Highway Department with headquarters at Bedford.

Myers, Clarence B., has resigned from the Pennsylvania State Highway Department to become assistant engineer in the Philadelphia Bureau of Highways.

Corwin, J. O., Jr., has been appointed engineer of Travis county, Texas.

Smithley, Charles, has been appointed county engineer of Geary county, Kan.

Rhodes, A. T., formerly street commissioner of Worcester, Mass., was recently appointed representative of the Austin-Western Road Machinery Co. in the New England district.

Harris, A. L., has just been appointed municipal architect for the city of Washington, D. C.

Marden, Charles, of Detroit, Mich., was again elected village engineer of Grosse Point, Park, Mich., at a recent election.

McLean, J. C., has been appointed county engineer at Woodbury county, La.

Michel, B. G., has resigned as city engineer of Kitchener, Ont., in order to enter business as road contractor.

Robertson, Peter, of Beansville, Ont., has resigned as road superintendent of Lincoln, county, Ont. His position will be filled by Frank N. Rutherford, of St. Catherines, Ont.

Lanctot, Theodore, of Montreal, has been appointed city engineer of Hull, Quebec.

Jepson, W. C., was recently appointed city engineer of Niagara Falls, Ont.

Caldwell, R. E., of Caldwell & Richards, civil engineers of Salt Lake City, Utah, has been appointed state engineer of Utah by Governor Charles R. Mabey.

Hommon, H. B., of the United States Public Health Service, has been appointed head of the sanitation work in United States National Parks with headquarters in San Francisco. Charles Gilman Hyde has been named as consultant in connection with this work.

Worley, J. E., has been appointed chief engineer of the Kansas Public Utilities Commission with headquarters in Topeka, Kan.

Rhodes, A. J., has been appointed city engineer of Manhattan, Kan.

Chambers, John, city engineer of Louisville, Ky., has been appointed chief engineer and superintendent of the Louisville Water Co.

Hewett, F. R., has resigned as county construction engineer of Adams county, Washington, to accept a position with the Washington State Highway Department. His former position has been filled by G. C. Sturman.

Dix, Thurman W., has been appointed state highway commission of Vermont.

Tuttle, William C., has been appointed superintendent of highways and water works of Attleboro, Mass.

Walker, Thomas H., chief inspector of the engineering department of the Kansas City Water Works Department, died in Kansas City on March 20.

Mead, Thomas, formerly deputy engineer, has been appointed county engineer for Whitman county, Wash.

Terrell, R. C., has resigned as state highway engineer of Oklahoma, and B. F. Clark appointed to his position.

Fredenhagen, V. B., has been appointed county engineer of Fewell county, Kan.

Rice, C. E., has been appointed city engineer of Wooster, Ohio.

Freeman, B. C., has been appointed resident engineer of pavement projects and roads for the state highway department in Sanilac county.

Larson, W. H. formerly county highway superintendent of Union county, South Dakota, has been appointed county highway superintendent of Hughes county. His former position will be filled by L. J. Johnson, of Elk Point.

Naylor, Perry T., formerly assistant city engineer of Hastings, Neb., has been appointed city engineer.

Brownell, James P., civil engineer with offices in Carthage, N. Y., has been appointed city engineer of that city.

Peck, Frank S., formerly state highway engineer of South Dakota, has been appointed highway engineer of Minnehaha county, South Dakota.

Mitchell, A. F., acting district engineer of the Dominion Department of Public Works, Victoria, B. C., has been appointed senior assistant engineer.

Doncaster, P. E., senior assistant engineer of the Dominion Department of Public Works, at Westminster, B. C., has been transferred to Nelson to succeed J. P. Forde, who will be in charge at Victoria.

Shupe, Stanley, town engineer of Oshawa, has resigned to become city engineer of Kitchener to succeed G. B. Michel, who recently resigned.

Lazinby, Paul A., has been appointed engineer to the newly organized Toronto Transportation Commission, Toronto, Can.

Feiker, F. M., vice-president of the McGraw-Hill publications, has been appointed personal assistant to Herbert Hoover, Secretary of the United States Department of Commerce.

French, L. G., for thirteen years assistant secretary of the American Society of Mechanical Engineers, died April 18. He was editor and manager of *The Mechanical Engineer*, and also author of several books on mechanical engineering, including the earliest American treatise on the steam turbine.

T. L. SMITH

Mr. Thomas L. Smith, founder, director and chief stockholder of the T. L. Smith Company, died Friday, April 29, 1921, at his home in Milwaukee. The early part of his career, immediately following his college life, was spent in drafting and engineering work with some of Milwaukee's large manufacturers. His interest in concrete mixers developed in 1898 and 1899 when he was conducting a school of engineering and mechanical drawing in Milwaukee, and the first machine was manufactured in 1900 and gave ten years of hard service. In 1905 Mr. Smith organized the T. L. Smith Company, which today has assets of over $1,200,000.

The T. L. Smith Company represents only one of Mr. T. L. Smith's successful business ventures. Mr. Smith purchased a controlling interest in the Sterling Wheelbarrow Co., West Allis, Wis. He also organized and developed the Smith Engineering Works, Milwaukee, manufacturers of Telsmith rock and ore crushers.

New Appliances

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations

SPECIALTY LOADERS

The Specialty Engineering Company, designers of the first portable wagon loader of the chain and bucket type, makes a number of portable loading machines suitable for handling sand, gravel, broken stone, coal and other materials.

The No. 15 wagon loader, 11 feet 6 inches high, is mounted on 48-inch wheels and has 16 x 9-inch malleable iron buckets, a hopper 24 inches wide, back chute with gate and 24 x 48-inch screen with three sizes of mesh and a plain steel plate. The bucket chains are double, the bearings are of the bronze ball and socket type, and the machine is operated with a 3 h. p. motor in a dust-proof casing and has a capacity to screen and load 1 ton in less than 2 minutes.

A similar machine having a height of 9 feet has been designed for hard continuous service, weighs about 4,400 pounds and will load 1 ton of sand or stone per minute. It has no screens.

A portable machine of the belt type is provided with side plates forming a wide trough enabling it to carry a large quantity of bituminous coal or other material. The three-ply rubber belt is reinforced on the conveying surface and travels on steel tube pulleys with self-lubricating bearings. It has a screw take-up adjustment and is light, strong and efficient.

In another type of conveyor made by the same manufacturers the belt travels on troughing rollers, giving it a greater capacity, and is supported on a trussed framework of structural steel suspended near the center of gravity by a chain hoist that enables it to be set at any required elevation and inclination. It is useful for unloading cars, filling high storage piles, filling stock bins or loading wagons or trucks. It is made in lengths of 25 to 60 feet on centers with vertical heights up to 23 feet, and horizontal reach of 58 feet and weighs up to 16,000 pounds.

TEC TRUCKS

Tec trucks, manufactured by the Terminal Engineering Company, Incorporated, are sturdy, powerful, compact, small-size trucks designed for duty on highways, in buildings, yards and especially for terminal service and for handling large quantities of merchandise rapidly and continuously for short distances, as in loading, unloading, transferring and storing.

Special provision for continuity of service and the elimination of waiting time is provided by the supplementary loading platforms that can be almost instantly transferred to and from the truck by the truck itself, enabling the latter to be constantly in motion while the cargoes are being loaded and unloaded without loss of time.

This is accomplished by making the truck with a low, narrow platform with clearance enabling it to be quickly inserted under the loading platform, which is then transferred to it and carried with its load. The loading platform is of heavy steel and wood construction with or without rollers.

The truck is equipped with five electric motors separately driving its four carrying and steering wheels and its lifting jacks. It has a 47½ x 122-inch platform 24 inches high, four independent rubber tired wheels built with roller bearings, a 60-volt 24-cell battery good for 24 hours' continuous operation, a capacity of 5,000 pounds and a speed of ½ mile to 10 miles per hour.

It has a drum controller, automatic coupler, and efficient brakes and springs. It is provided with electric lights and horn and has elevating loading and unloading jacks with 9½-inch travel. Among the numerous special uses for which it is recommended are the transportation of dumping buckets, elevating loaders, derricks, concrete mixers, air compressors, fire apparatus, etc.

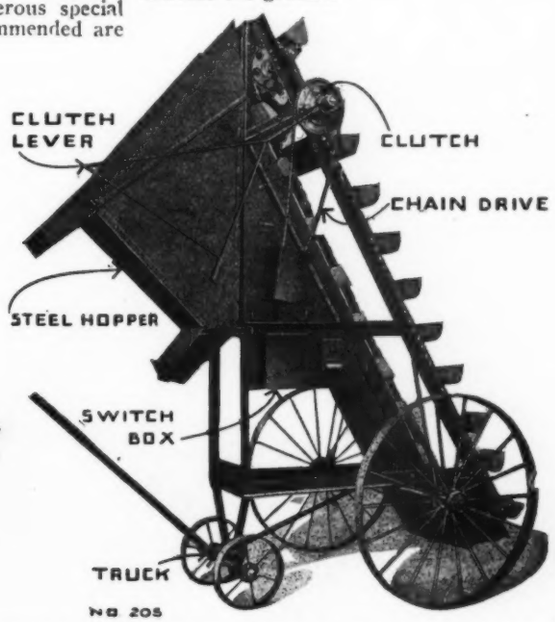
ARCADIA TRAILERS FOR MOTOR TRUCKS

The Arcadia Body Corp. and the Arcadia Trailer Corp., both of Newark, N. Y., issue circulars illustrating many different types of truck and trailer bodies with open and closed tops, racks, platforms and dumping apparatus and with these combined. They also show the principal details and structural features of the Arcadia trailers and reversible trailers which are made in 2, 3, 4 and 5-ton sizes with capacities of 113 to 150 cubic feet and weights of from 1,500 to 5,000 pounds. The trailers are provided with special drawbar attachments so that one or more trailers attached to a truck will follow exactly in the path of the latter without any attention.

ROGERS ALL STEEL TRAILERS

All-steel trailers manufactured by the Rogers Brothers Company are made in 2-wheel and 4-wheel types with various special features. They are made in 2, 3, 5, 7½ and 10-ton sizes with 4-wheel reversible short-turn gear type and in the same sizes of 4-wheel non-reversible type. The 2-wheel semi-dump type are made in 3, 5 and 7½-ton sizes, as is the semi-trailer. There are logging trailers with a capacity of 1, 3, 5, 7½ and 10 tons on the axle and dump trailers of 2, 2½ and 3-ton capacity. The model FD trailer has a special platform frame with clearance at the rear for the dump body to revolve downward through and clear of it till the lower end nearly or quite touches the ground.

BELT TYPE LOADER WITH SIDE PLATES



BUCKET LOADER WITH HOPPER AND BACK CHUTE

STEEL BODIES FOR GARBAGE COLLECTION

The city of Madison, Wis., has placed in service several Winther chasses fitted with garbage bodies and hydraulic hoists for dumping them that were manufactured by the Heil Co., Milwaukee, Wis.

These particular bodies have six covers. The front four open at the sides and the rear two open at the back. Adjustable steps on either side of the body and at the rear make it easy to load the body. The bodies are thoroughly welded by the electric process so that no liquid garbage can drip on the street. The tail gate is hinged at the top so that it swings outward when released. It is held tightly in place with four wing nuts. Between the tail gate and the body rubber packing is placed to keep it tight. If bodies are desired without covers, loops are provided on the sides so that a canvas cover can be tied over. It frequently happens that bodies are made with a taper at the rear end, i.. which case the tail gate is not necessary, as the bottom of the body tapers or slopes up to the top.

All Heil Co. bodies are made 3 inches wider at the rear than at the front, so that the load will slide out freely. All rivets are countersunk and there is nothing to obstruct the flow of material whenever the body is elevated.

The Hydro hoist is particularly adapted for this kind of work as it is mounted under the body, thus permitting all the loading space to be utilized. This makes it possible for a longer body to be used than if the hoist was placed just back of the cab. These bodies and hoists are designed to be mounted on any make or model of truck. They are neat, durable and sanitary and avoid nuisance in transporting offensive materials.

Cities which do not wish to buy expensive equipment can purchase light trucks and install on them gravity bodies. These bodies are considerably higher because of their design; nevertheless are of great advantage because they can be easily dumped. Moreover, the cost is very slight as a one and one-half yard body costs only $120 plus the war tax.

GARBAGE BODY WITH SECTIONAL COVER

INDUSTRIAL NOTES

D. Henry Bonner, who recently resigned from the Ford Motor Company, has joined the Four-Wheel Drive Auto Co., in the capacity of sales manager.

Sauerman Bros., of Chicago, have arranged with Mr. S. D. LeClair, of San Francisco, to take over the manufacturing and selling rights of his power drag scraper. This gives Saueramn Bros. four different types of scrapers: the "Crescent," "Type C," "Excavator" and "LeClair," all of which are bottomless and thus require no power or mechanism for dumping.

The Equipment Corporation of America is to erect a large plant for the rebuilding of heavy contractors' equipment at Maywood, Ind. Their present plant at Chicago will be continued to rebuild hoisting engines, concrete mixers, pumps ad similar small equipment. This will give the Equipment Corporation five plants in all.

The Badger Meter Manufacturing Company, of Milwaukee, Wis., has opened a district sales and service office in Kansas City, Mo., which office will be in charge of Charles Stotler, western sales manager. This company will be represented in Arkansas and Oklahoma by Charles Barry, and in Texas and Louisiana by Luke L. Ballard.

The Warren Bituminous Paving Co., of Ontario, has removed its business offices to Toronto.

William S. Turner & Co., Portland, Ore., has been organized as manufacturers' agents for the sale of equipment for electric railways, lighting and power systems, pumping and industrial plants, to make investigations and reports; and to design and construct public utility, municipal and manufacturing works.

The Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa., has opened an office in Detroit, in charge of M. P. Cogswell, to handle the Michigan and northwestern Ohio territory.

The Hallidie Machinery Co., of Seattle, Wash., has been appointed representative of the Conveyors Corporation of America, Chicago, to handle the sale of the American steam conveyor and the American trolley carrier in Washington and Oregon.

The American Engineering Co., of Philadelphia, Pa., manufacturers of the Taylor stoker, has established a midwestern service station at Detroit, Mich., which branch will carry a complete stock of parts for all types and sizes of Taylor stokers.

The Byers Machine Co., of Ravenna, Ohio, has opened direct sales offices for its cranes and hoists, one at New York under F. W. S. Elmes, district manager, and one at St. Louis, with Frank E. Miner as district manager.

Homer J. Forsythe, manager on the construction division of the engineering department of the Du Pont Company, has been transferred to the position of assistant general manager of the Hyatt Roller Bearing Company, of Newark, N. J.

The Western Wood Pipe Publicity Bureau has opened an office at 775-777 Monadnock building, San Francisco, Cal., in order to follow more closely the irrigation, water supply and other hydraulic developments of that section of the country, and to provide closer contact with the California companies it serves.

The contractors' equipment line of the Clyde Iron Works Sales Co., of Duluth, Minn., has recently been placed with Edelen & Co., Philadelphia, the Queen City Supply Co., of Cincinnati, and Waldo Bros. & Bond Co., of Boston. The sales territory of this latter company will comprise all of the New England states.

The Engineering Business Exchange has just opened a southwestern branch at Washington, D. C., with Marshall O. Leighton, consulting enginer, as director. This branch will have especial charge of the territory from Maryland to Alabama, inclusive.

INFORMATION BUREAU FOR NEW YORK STATE CONTRACTORS

In order to supply complete information to contractors for all New York State departments, the American Surety Company of New York has opened a State Surety Bond Bureau at 148 State street, Albany. The service of this bureau will be to furnish without cost to its clients accurate contract news from every department as soon as the information is made available to the public.

The State Surety Bond Bureau will be under the direction of Farrington Smith, who has had long experience in the insurance and surety fields. The work will be comprehensive, covering not only construction work but also supplies of every kind. Some of the services of the bureau will be: Daily bulletins containing notices of all state calls for bids on purchases, sales and construction work; the furnishing of bidding blanks and specifications to all contractors interested; telegraphic notice of bid openings and awards; filing of bid papers; reporting of bid openings, with prices.

While a few of the state departments have for periods sent calls for bids to contractors, there has been no way of getting information from all departments except at considerable expense in keeping a representative in Albany. The State Surety Bond Bureau will in effect act as Albany representative for its client contractors, serving them in every possible way.

The office of the bureau will be entirely distinct from the Albany branch of the American Surety Company, which solicits and executes surety bonds of all kinds, including public official and depository bonds and which is located at 100 State street.

ROAD BUILDING EQUIPMENT

The new Materials Handling Division of the American Society of Mechanical Engineers reserved sessions for the discussion of "Design and Construction of Machinery for Road Building" at the society's spring meeting which was held at Congress Hotel, Chicago, May 23-26. Four papers treated this problem from the viewpoint of the contractor, the road builder, and possible future development of mechanical equipment in road building.